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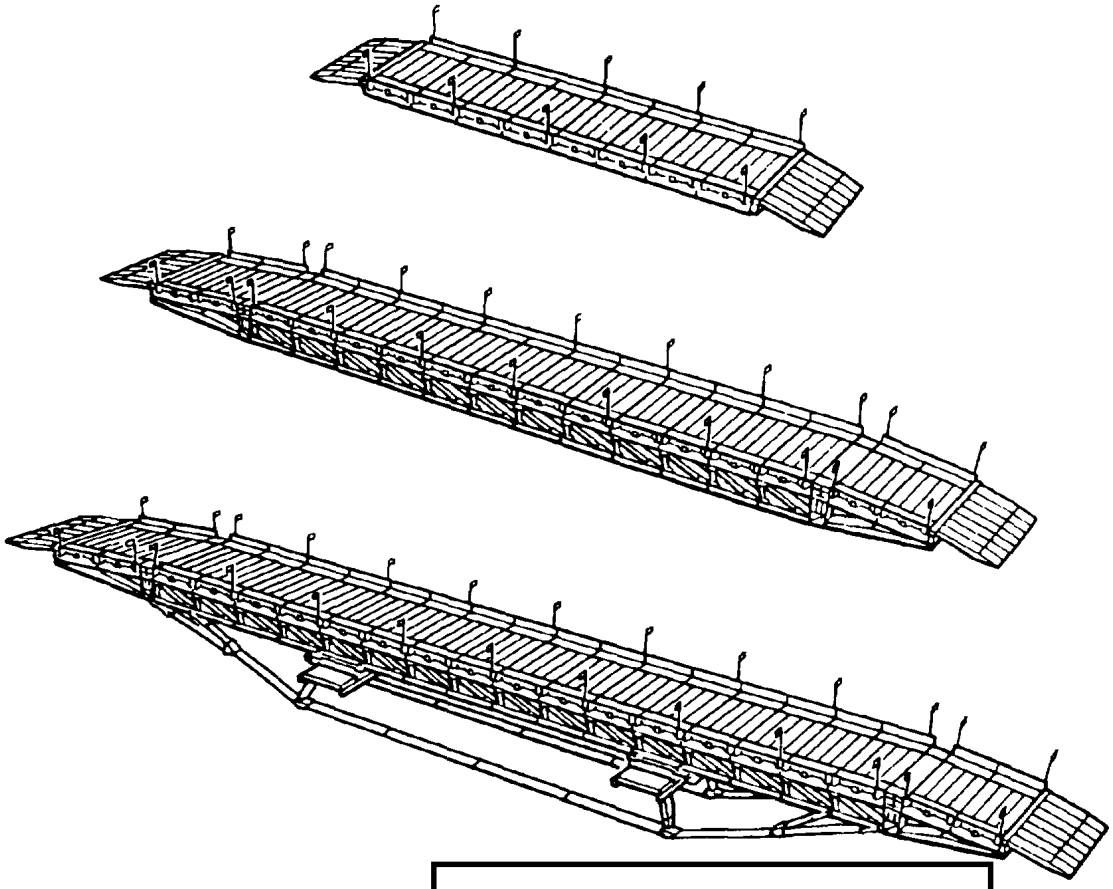

Equip. Desc. Page 1-8
Equip. Data Page 1-72
Prep. For Use Page 3-1
Design Pro. Formas Page 3-48
General Drills Page 4-1
Single Story Page 5-1
Double Story Page 6-1
Link Reinforced Page 7-1

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**HEADQUARTERS, DEPARTMENT OF THE ARMY
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16 FEBRUARY 1993

CHANGE

NO. 2

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WASHINGTON, D.C., 27 December 1996

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3-23 through 3-26	3-23 through 3-26
3-49 through 3-52	3-49 through 3-52
4-3 and 4-4	4-3 and 4-4
B-3 through B-8	B-3 through B-8
B-15 through B-22	B-15 through B-22
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B-37 through B-42	B-37 through B-42
B-47 through B-50	B-47 through B-50

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OPERATOR'S MANUAL

MEDIUM GIRDER BRIDGE
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WARNING

MGB cannot be used when bridging requirements exceed the capabilities given In Table 1-1.

Death or severe Injury to personnel and damage to equipment may result If personnel fail to observe safety precautions. Never throw tools or MGB components. Damage to components and tools will occur which can cause accidents.

All members of a work party must be fully aware of what actions are to take place prior to start of action.

Death or Injury to personnel will occur if extreme caution is not used when connecting bridge bays. Use correct lifting techniques and make sure of secure footing. Do not put fingers or hands into pin holes or between components being moved or connected.

Death or injury to personnel will occur If carrying bars are used to boom the bridge. Carrying bars can forcefully strike/crush personnel if the bridge were to run out of control Into the gap.

Death or personal injury can result If the bridge is launched or delaunched by hand. Launching/delaunching by hand can result In personnel loosing control and the bridge crashing into the gap. When a bridge is to be launched or delaunched, a vehicle must be used at all times.

Personnel must be down off the bridge and out of the bridge interior during booming, launching and delaunching. Never raise or lower one end of bridge unless the other end Is fixed on locked rollers, on the ground or secured to vehicle (when on capsill or front roller beams).

Exposure to hydraulic oil under pressure is hazardous. Exercise appropriate safeguards when working with the 15T and 20T jacks. Do not perform maintenance on the equipment while traffic Is on bridge.

When using compressed air, wear safety goggles or glasses and ensure air blast Is not directed toward another person.

Welding of steel MGB components can be done at Direct Support Maintenance level. Welding aluminum MGB components requires special skills, equipment and safety procedures to prevent the risk of explosion and ensure structurally safe repair. Therefore welding of aluminum MGB components will only be done at Depot maintenance.

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TECHNICAL MANUAL

NO. 5-5420-212-10-1

HEADQUARTERS
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WASHINGTON, D.C., 16 FEBRUARY 1993

OPERATOR'S MANUAL

MEDIUM GIRDER BRIDGE
INCLUDING

BRIDGE	NSN 5420-00-172-3520
BRIDGE ERECTION SET	NSN 5420-00-172-3519
LINK REINFORCEMENT SET	NSN 5420-01-139-1503

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You can help improve this manual. If you find any mistakes, or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <mpmt%avma28@st-louis-emh7.army.mil>. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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TABLE OF CONTENTS

		PAGE
	HOW TO USE THIS MANUAL	xix
CHAPTER 1.	INTRODUCTION	1-1
Section I.	GENERAL INFORMATION	1-1
1-1	SCOPE	1-1
1-2	MAINTENANCE FORMS AND RECORDS	1-1
1-3	REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS	1-1
1-4	NOMENCLATURE CROSS REFERENCE LIST	1-1
1-5	LIST OF ABBREVIATIONS	1-4
1-6	GLOSSARY	1-6

*This manual supersedes TM 5-5420-212-12, dated 18 April 1985, including all changes.

Page

Section II. EQUIPMENT DESCRIPTION 1-8
1-7 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES 1-8
1-8 BRIDGE LENGTH 1-10
a. Single Story 1-10
b. Double Story with and without LRS 1-10
1-9 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS 1-15
1-10 EQUIPMENT DATA 1-72
Section III. PRINCIPLES OF OPERATION 1-85
1-11 INTERFACE OF MGB COMPONENTS 1-85
CHAPTER 2 OPERATING INSTRUCTIONS 2-1
Section I. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) 2-1
2-1 INTRODUCTION 2-1
2-2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES 2-1
Section II. OPERATION UNDER USUAL CONDITIONS 2-3
Section Ill. OPERATION UNDER UNUSUAL CONDITIONS 2-4
2-3 LAUNCHING IN HIGH WINDS 2-4
2-4 LAUNCHING UP STEEP SLOPES 2-6
CHAPTER 3 PREPARATION FOR USE 3-1
Section I. INTRODUCTION 3-2
Section II. SERVICE ON RECEIPT 3-2
3-1 INTRODUCTION 3-2
3-2 SERVICE ON RECEIPT 3-2
Section III. PRELIMINARY PLANNING 3-2
3-3 SAFE WORKING LOADS 3-2
a. General 3-2
b. To find the maximum allowable load ‘LOAD’ 3-2
c. Maximum loading of bridge components 3-5
3-4 PRELIMINARY STUDIES 3-8
3-5 SITE SELECTION 3-8
3-6 RECONNAISSANCE REPORT 3-14

		Page
3-7	CHOICE OF BRIDGE LENGTH AND CLASS	3-14
3-8	BRIDGE CONSTRUCTION TIMES	3-15
3-9	WORK PARTY REQUIRED	3-16
Section IV.	DESIGN	3-16
3-10	DESIGN PHASE 1	3-16
3-11	DESIGN PHASE 2	3-18
3-12	SINGLE STORY 4 thru 12 BAY DESIGN	3-18
3-13	SINGLE STORY 9 thru 12 BAY DESIGN ON RESTRICTED SITES	3-26
3-14	DOUBLE STORY 2E + 1 thru 2E + 12 BAY DESIGN	3-26
3-15	DOUBLE STORY 2E + 1 thru 2E + 12 BAY DESIGN ON RESTRICTED SITES	3-34
3-16	DOUBLE STORY 2E + 13 thru 2E + 22 BAY DESIGN w/o LRS	3-35
3-17	DOUBLE STORY 2E+13 thru 2E+22 BAY DESIGN WITH LRS	3-42
Section V.	TRANSPORT AND PALLETIZATION	3-57
3-18	TRANSPORT REQUIREMENTS	3-57
3-19	PALLETIZATION - SINGLE STORY	3-57
a.	Pallet Load SR DC 4 through 12	3-57
b.	Pallet Load ES 4 thru 7/8	3-41
c.	Pallet Load ES 1112	3-72
d.	Pallet Load SSE and SSE 6/8	3-75
e.	Pallet Load SSC 8 thru 12	3-79
3-20	PALLETIZATION - DOUBLE STORY	3-85
a.	Pallet Load LR/D	3-85
b.	Pallet Loads DSC, EOB1 and EOB2	3-86
c.	Pallet Load ED	3-96
d.	Pallet Loads DSC1 and DSC2	3-102
3-21	PALLETIZATION - LINK REINFORCEMENT	3-109
a.	Pallet Load LRS-1	3-109
b.	Pallet Load LRS-2	3-116
3-22	PALLETIZATION - SPARES PALLETS	3-122
3-23	LOADING PALLETS ON TRANSPORT VEHICLES	3-122
a.	Loading Pallets on Trailer	3-122
b.	Securing Pallets on Trailer	3-124
c.	Loading Pallet on Truck	3-128

		Page
d.	Securing Pallet on Truck	3-128
3-24	OFF-LOADING PALLETS FROM TRANSPORT VEHICLES	3-132
a.	Off-Loading Pallets from Trailer	3-132
b.	Off-Loading Pallets from Truck	3-134
c.	Off-loading on Normal Sites	3-136
d.	Off-loading on Restricted Sites	3-138
CHAPTER 4	**GENERAL DRILLS**	4-1
4-1	INTRODUCTION	4-2
4-2	PANEL POINT CODE AND CENTER OF GRAVITY	4-2
a.	Single Story	4-2
b.	Double Story and Link Reinforced	4-3
c.	Boom and Center of Gravity Marker	4-3
4-3	LAUNCHING NOSE CODE	4-3
4-4	LANDING ZONE NUMBER	4-4
4-5	ROLLER BEAMS	4-4
a.	Single Story	4-4
b.	Double Story 2E + I thru 2E + 12 bay	4-5
c.	Double Story Using Capsill Roller Beam	4-10
d.	Leveling and Re-staging Roller Beams	4-12
e.	Locking Roller Beams	4-14
4-6	CONNECTING TOP PANELS	4-16
a.	Top Panel to Top Panel or Bankseat Beam	4-16
b.	Top Panel to Top Panel - Double Story	4-16
c.	Top Panel to Junction Panel	4-17
d.	Use of Panel Erection Aid	4-17
4-7	CONNECTING BOTTOM PANELS	4-18
a.	Bottom Panel to Top and Bottom Panels	4-18
b.	Bottom Panel to Top and Junction Panels	4-20
4-8	ASSEMBLE FRONT END OF BRIDGE AND FIRST BAY (DOUBLE STORY)	4-20
a.	General	4-20
b.	Assembly	4-20
4-9	ASSEMBLE REAR END OF BRIDGE	4-25
a.	Single Story	4-25

		Page
b.	Double Story	4-27
4-10	CONNECTING LAUNCHING NOSE ROLLER	4-33
4-11	CONNECTING/DISCONNECTING LAUNCHING NOSE CROSS GIRDER & POSTS	4-33
a.	Single Story	4-33
b.	Double Story	4-34
c.	Setting Launching Nose Cross Girder	4-35
4-12	ASSEMBLING LAUNCHING NOSES FOR LAUNCH	4-36
a.	Single Story 1 thru S Bay	4-36
b.	Single Story 8 thru 12 Bay - Double Story 2E + 1 thru 2E + 18	4-38
c.	Link Reinforced 2E + 18 thru 2E + 22 and Double Story w/o Link 2E + 19 thru 2E+22	4-42
4-13	STRIPPING LAUNCHING NOSES DURING LAUNCH	4-45
a.	Bridges with a Single Story Nose	4-45
b.	Bridges with a Double Story Nose	4-46
4-14	ASSEMBLING LAUNCHING NOSES FOR DELAUNCH	4-47
a.	Single Story 8 thru 12 Bay. Double Story 2E + 1 thru 2E + 22	4-47
b.	Link Reinforced Bridges	4-49
4-15	LANDING ROLLER PEDESTAL	4-49
a.	Setting Up Landing Roller Pedestal	4-49
b.	Stability of Landing Roller Pedestal	4-51
c.	Recover Landing Roller Pedestal	4-52
4-16	FITTING LINK COMPONENTS	4-52
a.	Fitting Anchor Assembly and First Link	4-53
b.	Fitting Post Tensioning Assembly, Footwalk and Second Link	4-56
c.	Fitting Light Tackle	4-61
d.	Fitting Anti Flutter Tackle	4-62
e.	Tensioning	4-63
4-17	OPERATION OF PULLER	4-63
a.	Threading Cable into Puller and Taking Up Slack	4-63
b.	Preparing Puller to Take Load	4-64
c.	Selecting Speed	4-64
d.	Taking In	4-64
e.	Paying Out	4-64
f.	Anchoring the Puller	4-64

		Page
4-18	LAUNCHING BY VEHICLE	4-65
a.	Connecting Push Bar Cross Girder to Panel	4-65
b.	Connecting Push Bar Adapter and Push Bar	4-65
c.	Connecting Push Bar to Bankseat Beam	4-67
d.	Booming	4-68
e.	Disconnecting Push Bar	4-68
4-19	BOOMING/LAUNCHING THE BRIDGE	4-68
a.	Bridge on RB or FRB and RRB	4-69
b.	Bridge on CRB, FRB and RRB	4-70
4-20	JACKING	4-71
a.	General Principles	4-71
b.	Jack Operation	4-72
c.	Jack Post and Jack - Single Story	4-72
d.	Jack Post and Jack - Double Story	4-73
e.	Jacking Down - Single Story up to 8 Bay	4-74
f.	Jacking Down - Single Story over 8 Bay and All Double Story	4-78
g.	Jacking When Home Bank has Crossfall	4-81
h.	Jacking When Far Bank Has Crossfall	4-82
4-21	DAVITS	4-82
a.	General	4-82
b.	Lowering Bridge	4-82
4-22	CRANE	4-87
a.	General	4-87
b.	Lowering Bridge	4-87
4-23	PACKING ENDS OF BRIDGE	4-88
a.	General	4-88
b.	Packing	4-49
4-24	LAYING RAMPS	4-90
a.	General	4-90
b.	Procedure	4-90
4-25	LAYING DECKS	4-91
4-26	FITTING CURBS AND GUIDE MARKERS	4-92
4-27	STRIPPING ON ORIGINAL FAR BANK	4-93
a.	Removing Junction Panel	4-93

		Page
b.	Removing Bottom Panels	4-94
c.	Removing Top Panels	4-95
CHAPTER 5	**SINGLE STORY BRIDGE**	5-1
Section I.	GENERAL	5-2
Section II.	NORMAL SITES.	5-9
5-1	ASSEMBLY - SINGLE STORY -5 BAY	5-9
a.	Set Up and Align Roller Beam	5-9
b.	Assembly	5-9
5-2	DISASSEMBLY - SINGLE STORY-S BAY	5-14
a.	Preparation for Disassembly	5-14
b.	Disassembly	5-14
5-3	ASSEMBLY- SINGLE STORY- 12 BAY	5-20
a.	Set Up and Align Roller Beam	5-20
b.	Assembly	5-20
5-4	DISASSEMBLY - SINGLE STORY -12 BAY	5-27
a.	Preparation for Disassembly	5-27
b.	Disassembly	5-27
Section III.	RESTRICTED SITES	5-32
5-5	ASSEMBLY - SINGLE STORY - 12 BAY (Restricted Site)	5-32
a.	General	5-32
b.	Assembly	5-32
5-6	DISASSEMBLY - SINGLE STORY - 12 BAY (Restricted Site)	5-36
a.	General	5-36
b.	Disassembly	5-36
Section IV.	COUNTERWEIGHTS - SINGLE STORY	5-39
5-7	6 BAY - NORMAL SITE	5-39
5-8	7 BAY - NORMAL SITE	5-39
5-9	8 BAY - NORMAL SITE	5-39
5-10	9 AND 10 BAY- RESTRICTED SITE	5-40
5-11	11 AND 12 BAY - RESTRICTED SITE	5-40
Section V.	OVERBRIDGES - SINGLE STORY	5-41
5-12	GENERAL	5-41

		Page
5-13	DESIGN	5-41
5-14	ASSEMBLY	5-42
a.	Assembly using a launching nose	5-42
b.	Assembly without a launching nose	5-42
Section VI.	ANCHORAGE - SINGLE STORY	5-46
5-15	BASIC CONSIDERATIONS	5-46
5-16	TYPES OF ANCHORAGE	5-46
5-17	PICKET TYPE INSTALLATION	5-47
5-18	APPROACH GUY INSTALLATION	5-47
CHAPTER 6	**DOUBLE STORY BRIDGE**	6-1
Section I.	GENERAL	6-2
Section II.	NORMAL SITES	6-29
6-1	ASSEMBLY - DOUBLE STORY - 2E + 12 BAY	6-29
a.	Set up and align roller beams	6-29
b.	Assembly	6-29
6-2	DISASSEMBLY- DOUBLE STORY- 2E + 12 BAY	6-34
a.	Preparation for Disassembly	6-34
b.	Disassembly	6-34
6-3	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Normal Site - Original Far Bank)	6-40
a.	General	6-40
b.	Disassembly	6-40
6-4	ASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT	6-45
a.	Set up and align roller beams	6-45
b.	Assembly	6-45
6-5	DISASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT	6-50
a.	Preparation for Disassembly	6-50
b.	Disassembly	6-50
Section III.	RESTRICTED SITES	6-55
6-6	ASSEMBLY - DOUBLE STORY 2E + 12 BAY (Restricted Site)	6-56
a.	General	6-56
b.	Assembly	6-56
6-7	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Near Bank)	6-58

		Page
a.	General	6-58
b.	Disassembly	6-58
6-8	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Original Far Bank)	6-60
a.	General	6-60
b.	Disassembly	6-60
Section IV.	COUNTERWEIGHTS - DOUBLE STORY	6-64
6-9	2E + 19 thru 2E + 22 w/o LRS - NORMAL SITE	6-64
6-10	2E + 13 thru 2E + 18 W/O LRS - RESTRICTED SITE	6-64
6-11	2E + 19 thru 2E + 22 w/o LRS - RESTRICTED SITE	6-65
Section V.	OVERBRIDGES - DOUBLE STORY	6-67
6-12	GENERAL	6-67
6-13	DESIGN	6-67
6-14	ASSEMBLY	6-68
a.	Assembly Using a Launching Nose	6-68
b.	Assembly without a Launching Nose (2E + 3 through 2E + 12 bay double story)	6-68
Section VI.	ANCHORAGE - DOUBLE STORY	6-72
6-15	BASIC CONSIDERATIONS	6-72
6-16	TYPES OF ANCHORAGE	6-72
6-17	PICKET TYPE INSTALLATION	6-73
6-18	APPROACH GUY INSTALLATION	6-73
a.	General	6-73
b.	Installation	6-73
CHAPTER 7	**LINK REINFORCED BRIDGES**	7-1
Section I.	GENERAL	7-1
Section II.	NORMAL SITES	7-14
7-1	ASSEMBLY 2E + 22 BAY- LINK REINFORCED	7-14
a.	Set Up and Align Roller Beams	7-14
b.	Assembly	7-14
7-2	DISASSEMBLY - 2E + 22 BAY LINK REINFORCED	7-25
a.	Preparation for Disassembly	7-25
b.	Disassembly	7-25

		Page
7-3	DISASSEMBLY ON ORIGINAL FAR BANK	7-34
a.	General	7-34
b.	Skidding	7-34
c.	Disassembly, 22 Bay Link Reinforced	7-34
Section III.	COUNTERWEIGHTS - LINK REINFORCED BRIDGES	7-38
7-4	2E + 19BAY - NORMAL SITE	7-38
7-5	2E + 20 BAY - NORMAL SITE	7-38
7-6	2E +21 BAY-NORMAL SITE	7-38
7-7	2E + 22 BAY - NORMAL SITE	7-39
Section IV.	ANCHORAGE - LINK REINFORCED BRIDGES	7-40
CHAPTER 8	OPERATOR MAINTENANCE	8-1
Section I.	LUBRICATION	8-2
8-1	OPERATOR LUBRICATION	8-2
Section II.	TROUBLESHOOTING	8-2
8-2	OPERATOR TROUBLESHOOTING PROCEDURES	8-2
Section III.	MAINTENANCE PROCEDURES	8-7
8-3	OPERATOR MAINTENANCE PROCEDURES	8-7
8-4	BRIDGE MARKER GUIDE	8-8
a.	Removal	8-8
b.	Service/Repair	8-8
c.	Installation	8-9
8-5	END TAPER PANEL, BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, BOTTOM PANEL, LAUNCHING NOSE HEAVY (Resilient Mount)	8-10
a.	Removal	8-10
b.	Service/Repair	8-13
c.	Installation	8-13
8-6	BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, LAUNCHING NOSE HEAVY) (Shoot Bolt)	8-12
a.	Removal	8-13
b.	Service/Repair	8-13
c.	Installation	8-13
8-7	BOTTOM PANEL (Shoot Bolt)	8-14
a.	Removal	8-14

		Page
b.	Service/Repair	8-15
c.	Installation	8-15
8-8	ROLLER BEAM (Jack Hood, Roller Catch)	8-16
a.	Removal	8-16
b.	Service/Repair	8-17
c.	Installation	8-17
8-9	LAUNCHING NOSE CROSS GIRDER (Safety Catch)	8-18
a.	Removal	8-18
b.	Service/Repair	8-19
c.	Installation	8-19
8-10	LAUNCHING NOSE CROSS GIRDER (Pins and Chains)	8-20
a.	Removal	8-20
b.	Service/Repair	8-20
c.	Installation	8-21
8-11	HYDRAULIC JACK (15T)	8-22
a.	Service	8-22
8-12	HYDRAULIC JACK (20T)	8-24
a.	Service	8-24
8-13	JACK POST	8-26
a.	Removal	8-26
b.	Service/Repair	8-27
c.	Installation	8-27
8-14	ADJUSTABLE SUPPORT (Shoot Bolt)	8-28
a.	Removal	8-28
b.	Service/Repair	8-29
c.	Installation	8-29
8-15	ADJUSTABLE SUPPORT (Pins and Chains)	8-30
a.	Removal	8-30
b.	Service/Repair	8-31
c.	Installation	8-31
8-16	ADJUSTABLE SUPPORT (Leveling Screw)	8-32
a.	Removal	8-32
b.	Service/Repair	8-33
c.	Installation	8-33

		Page
8-17	FIXED SUPPORT (Pin and Trunnion)	8-34
a.	Removal	8-34
b.	Service/Repair	8-35
c.	Installation	8-35
8-18	JACKING BRACKET (Pins and Pulleys)	8-36
a.	Removal	8-36
b.	Service/Repair	8-37
c.	Installation	8-37
8-19	PULLER	8-38
a.	Service	8-38
8-20	ANTI-SKID COATING	8-40
a.	Path Painting	8-40
Appendix A	REFERENCES	A-1
Appendix B	COMPONENT OF END ITEM AND BASIC ISSUE ITEMS	B-1
Section I.	INTRODUCTION	B-1
B-1	SCOPE	B-1
B-2	GENERAL	B-1
B-3	EXPLANATION OF COLUMNS	B-1
Section II.	COMPONENTS OF END ITEM	B-2
B-4	BRIDGE SET	B-2
B-5	ERECTION SET	B-13
B-6	LINK REINFORCEMENT SET	B-31
Section III.	BASIC ISSUE ITEMS BRIDGE ERECTION SET, FIXED BRIDGE, UK MGB	B-49
Appendix C.	ADDITIONAL AUTHORIZATION LIST	C-1
Section I.	INTRODUCTION	C-1
C-1	SCOPE	C-1
C-2	GENERAL	C-1
C-3	EXPLANATION OF COLUMNS	C-1
Section II.	ADDITIONAL AUTHORIZATION LIST	C-2
Appendix D	EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	D-1
Section I.	INTRODUCTION	D-1

		Page
D-1	SCOPE	D-1
D-2	EXPLANATION OF COLUMNS	D-1
Section II.	EXPENDABLE DURABLE SUPPLIES AND MATERIALS LIST	D-1
Appendix E	COMPONENTS PER BRIDGE LENGTH, BASKET AND PALLET LOADS	E-1
E-1	COMPONENTS PER BRIDGE LENGTH	E-1
E-2	BASKET LOADS	E-12
a.	General	E-12
b.	Single Story	E-12
c.	Double Story	E-17
d.	Link Reinforced	E-29
E-3	PALLET LOADS	E-30
a.	Single Story	E-30
b.	Double Story	E-34
c.	Link Reinforced	E-56
Index		Index-1

LIST OF ILLUSTRATIONS

FIGURE **Page**

1-1	MGB	1-0
1-2	Single story MGB	1-8
1-3	Double story MGB	1-8
1-4	Link reinforced MGB	1-9
1-5	Launching Single Story Bridges up to 50ft (15.2m)	1-85
1-6	Launching Single Story Bridges over 50ft (15.2m)	1-86
1-7	Single Story Bridge in Place	1-86
1-8	Launching Double Story Bridges up to 102ft (31.1m)	1-87
1-9	Double Story Bridge in Place	1-88
1-10	Launching Bridges over 102ft (31.1m)	1-88
1-11	Launching Bridges from 144ft (43.9m) to 162ft (49m)	1-88
1-12	Link Reinforced MGB in Place	1-89
1-13	Lowering End of Bridge using Davits	1-89
1-14	MGB Components on Pallet for Transportation	1-90
3-1	Approaches - single and double story	3-9
3-2	Approaches - link reinforced MGB	3-10
3-3	Assembly site	3-12
3-4	Bank clearance - link reinforced bridges	3-13
3-5	Angle of Repose with Slope of Bank Less than 45 degrees	3-16
3-6	Angle of Repose with Slope of Bank More than 45 degrees	3-17
3-7	Site Profile for Push launch	3-22
3-8	Site Profile for Jack Launch	3-22
3-9	Key Construction Points for SS 4-12 Bay	3-23
3-10	Site Profile - DS 1-12 Bay	3-29
3-11	Double Story - Distance D, W & C	3-30
3-12	Double Story - Distance R, T, G, H, & N	3-30
3-13	Site Profile DS 13-22 Bay w/o LRS	3-37
3-14	DS 13-22 Bay w/o LRS - Distance R, T, G, H & N	3-38

FIGURE **Page**

3-15 Site Profile DS 13-22 Bay with LRS 3-45
3-16 DS 13-22 Bay with LRS - Distance R, T, G, H & N 3-46

LIST OF TABLES

TABLE **Page**

1-1 Bridge Length V Maximum Load Capability 1-11
1-2 Single Story Bridge Length V Gap Width 1-11
1-3 Double Story Bridge Length V Gap Width 1-12
1-4 Link Reinforced Bridge Length V Gap Width 1-13
1-5 Work Parties for MGB 1-14
1-6 Building Times (good conditions) 1-14
2-1 Preventive Maintenance Checks and Services Daily Schedule (visual)
- Bridge Assembled 2-2
2-2 Preventive Maintenance Checks and Services Monthly Schedule (visual)
- Bridge Disassembled 2-3
2-3 Launching conditions 2-4
3-1 Maximum loading for girders 3-4
3-2 Maximum loading for components 3-5
3-3 Soil bearing capacity 3-11
3-4 Maximum current velocity v bridge length 3-13
3-5 Maximum wind speed v bridge length 3-14
3-6 Bridge Selection Tables 3-15
3-7 SS Bridges 4 through 8 bays site and bridge dimensions 3-19
3-8 SS Bridges 9 through 12 bays site and bridge dimensions 3-19
3-9 Bearings 3-20
3-10 SS Bridges 4 thru 8 Bays Launch Design 3-23
3-11 SS Bridges 9 thru 12 Bays 3-24
3-12 MGB Pallets SS 3-25
3-13 Working parties and building times on good sites 3-25

TABLE		Page
3-14	SS Bridges (9 through 12 bay) on Restricted Sites	3-26
3-15	DS MGB Design 2E + 1 thru 2E + 12 Bays Site and Bridge Dimensions	3-26
3-16	Bearings DS 1-12 Bay	3-27
3-17	Rule 1 - DS 1 thru 12 Bay	3-31
3-18	Rule 2 - DS 1 thru 12 Bay	3-31
3-19	Rule 3 - DS 1 thru 12 Bay	3-32
3-20	Rule 4a and 4b - DS 1 thru 12 Bay	3-33
3-21	MGB Pallets DS	3-33
3-22	D S Working Parties and Building Times on Good Sites	3-33
3-23	Effect of increasing nose length (DS bridges) on R distance	3-34
3-24	DS MGB 2E + 13 through 2E + 22 bays (w/o LRS)	3-35
3-25	Bearings DS 13-22 Bay w/o LRS	3-36
3-26	Rule 1 - DS 13-22 Bay w/o LRS	3-39
3-27	Rule 2 - DS 13-22 Bay W/o LRS	3-39
3-28	Rule 3a and 3b - DS 13-22 Bay w/o LRS	3-40
3-29	MGB Pallets DS 13-22 Bay W/o LRS	3-40
3-30	Working Parties and Building Time on Good Sites - DS 13-22 Bay w/o LRS	3-41
3-31	DS MGB Designl3-22 Bays with LRS	3-42
3-32	Bearings	3-43
3-33	Rule 1 - DS 13-22 Bay with LRS	3-46
3-34	Rule 2 - DS 13-22 Bay with LRS	3-47
3-35	MGB Pallets DS 13-22 Bay with LRS	3-47
3-36	Working Parties and Building Time on Good Sites - DS 13-22 Bay with LRS	3-48
5-1	Building and Boom Table - 4 through 8 Bay Single Story (Normal site)	5-3
5-2	Building and Boom Table - 9 through 12 Bay Single Story (Normal Site)	5-4
5-3	Building and Boom Table - 9 through 12 Bay Single Story (Restricted Site)	5-5
5-4	Delaunch Table 4 through 8 Bay Single Story (Normal Site)	5-6
5-5	Delaunch Table - 9 through 12 Bay Single Story (Normal Site)	5-7

TABLE		Page
5-6	Delaunch Table - 9 through 12 Bay Single Story (Restricted Site)	5-8
5-7	Central and eccentric deflections - Single Story Bridges	5-42
6-1	Building and Boom Table - 2E + I through 2E + 6 Bay Double Story (Normal Site)	6-3
6-2	Building and Boom Table - 2E + 7 through 2E + 12 Bay Double Story (Normal Site)	6-4
6-3	Building and Boom Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS) (Normal Site)	6-5
6-4	Building and Boom Table - 2E + 18 through 2E + 22 bay Double Story (w/o LRS) (Normal Site)	6-6
6-5	Building and Boom Table - 2E + 1 through 2E + 6 Bay Double Story (Restricted Site)	6-7
6-6	Building and Boom Table - 2E + 7 through 2E + 9 Bay Double Story (Restricted Site)	6-8
6-7	Building and Boom Table - 2E+ 10 through 2E + 12 Bay Double Story (Restricted Site)	6-9
6-8	Delaunch Table - 2E+ 1 through 2E + 6 Bay Double Story (Normal Site)	6-11
6-9	Delaunch Table - 2E+ 7 through 2E + 12 Bay Double Story (Normal Site)	6-12
6-10	Delaunch Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS) (Normal Site)	6-13
6-11	Delaunch Table - 2E + 18 through 2E + 22 Bay Double Story (w/o LRS) (Normal Site)	6-14
6-12	Delaunch Table - 2E + 1 through 2E + 6 Bay Double Story (Normal Site - Original Far Bank)	6-15
6-13	Delaunch Table - 2E + 7 through 2E + 12 Bay Double Story (Normal Site - Original Far Bank)	6-16
6-14	Delaunch Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS) (Normal Site -Original Far Bank)	6-17
6-15	Delaunch Table - 2E + 18 through 2E + 22 Bay Double Story (w/o LRS) (Normal Site - Original Far Bank)	6-18
6-16	Delaunch Table - 2E + 1 through 2E + 4 Bay Double Story (Restricted Site)	6-19
6-17	Delaunch Table - 2E + 5 through 2E + 6 Bay Double Story (Restricted Site)	6-20
6-18	Delaunch Table - 2E + 7 through 2E + 9 Bay Double Story (Restricted Site)	6-21
6-19	Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site)	6-22
6-20	Delaunch Table - 2E + 1 through 2E + 5 Bay Double Story (Restricted Site - Original Far Bank)	6-24
6-21	Delaunch Table - 2E + 6 through 2E + 9 Bay Double Story (Restricted Site -Original Far Sank)	6-25
6-22	Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site - Original Far Bank)	6-27

TABLE		Page
6-23	Minimum R Distance when using longer than standard launching noses	6-55
6-24	Central and eccentric deflections - Double Story Bridges	6-68
7-1	Building and Boom Table - 2E + 13 through 2E + 17 Bay Link Reinforced (Normal Site)	7-2
7-2	Building and Boom Table - 2E + 18 through 2E + 22 Bay Link Reinforced (Normal Site)	7-4
7-3	Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced	7-6
7-4	Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced	7-8
7-5	Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced (Normal Site - Original Far Bank)	7-10
7-6	Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced (Normal Site - Original Far Bank)	7-12
8-1	Operator Lubrication Table	8-2
8-2	Operator Troubleshooting	8-4
E-1	Components per Bridge Length (Single Story)	E-1
E-2	Components per Bridge Length (Double Story)	E-4
E-3	Components per Bridge Length (Link Reinforced)	E-9
E-4	Single Story Basket Loads	E-12
E-5	Double Story Basket Loads	E-17
E-6	Link Reinforced Basket Loads	E-29
E-7	Single Story Pallet Loads	E-30
E-8	Double Story Pallet Loads	E-34
E-9	Link Reinforced Pallet Loads	E-56

HOW TO USE THIS MANUAL

This manual is written to cover all levels of expertise in the use and operation of Medium Girder Bridge (MGB).

A general overview of all the manual is recommended before becoming familiar with the selected sections a user may require. The user should prepare fully by reading the appropriate procedures before moving to the bridge site. In particular, all users must be completely familiar with Chapters 1 and 4.

Chapter 1, Introduction, describes every MGB component and its use, so this is essential reading. Chapter 4, General Drills, describes how the bridge is coded during assembly/disassembly, how components are connected/disconnected, how the bridge is launched and how the bridge is raised or lowered to the ground. As these drills are used in all applications of MGB, it is essential that the operator understands them.

Chapter 2 describes operator Preventive Maintenance Checks and Services and then operation of MGB under unusual conditions, which is good reference for the experienced user.

If the user has to participate in site selection, reconnaissance, design or palletization, then Chapter 3 should be reviewed.

Chapters 5, 6 and 7 describe step by step assembly/disassembly procedures for selected bridges. The bridges described have been selected to be representative of that type of bridge, so that once the user is familiar with the selected bridge build (i.e. Assembly l2 bay double story, Chapter 6) he/she will be able to build all the other length bridges of that type (i.e. 9, 10 or 11 bay double story) with slight modification to the procedures and using the build and boom tables at the beginning of the chapter. A fully experienced user will be capable of assembling/disassembling any bridge using just the tables, which can also be found in TM 5-5420-212-10-2.

Maintenance of MGB at operator level is covered in Chapter 8. Unit and Direct Support maintenance procedures are found in TM 5-5420-212-23.

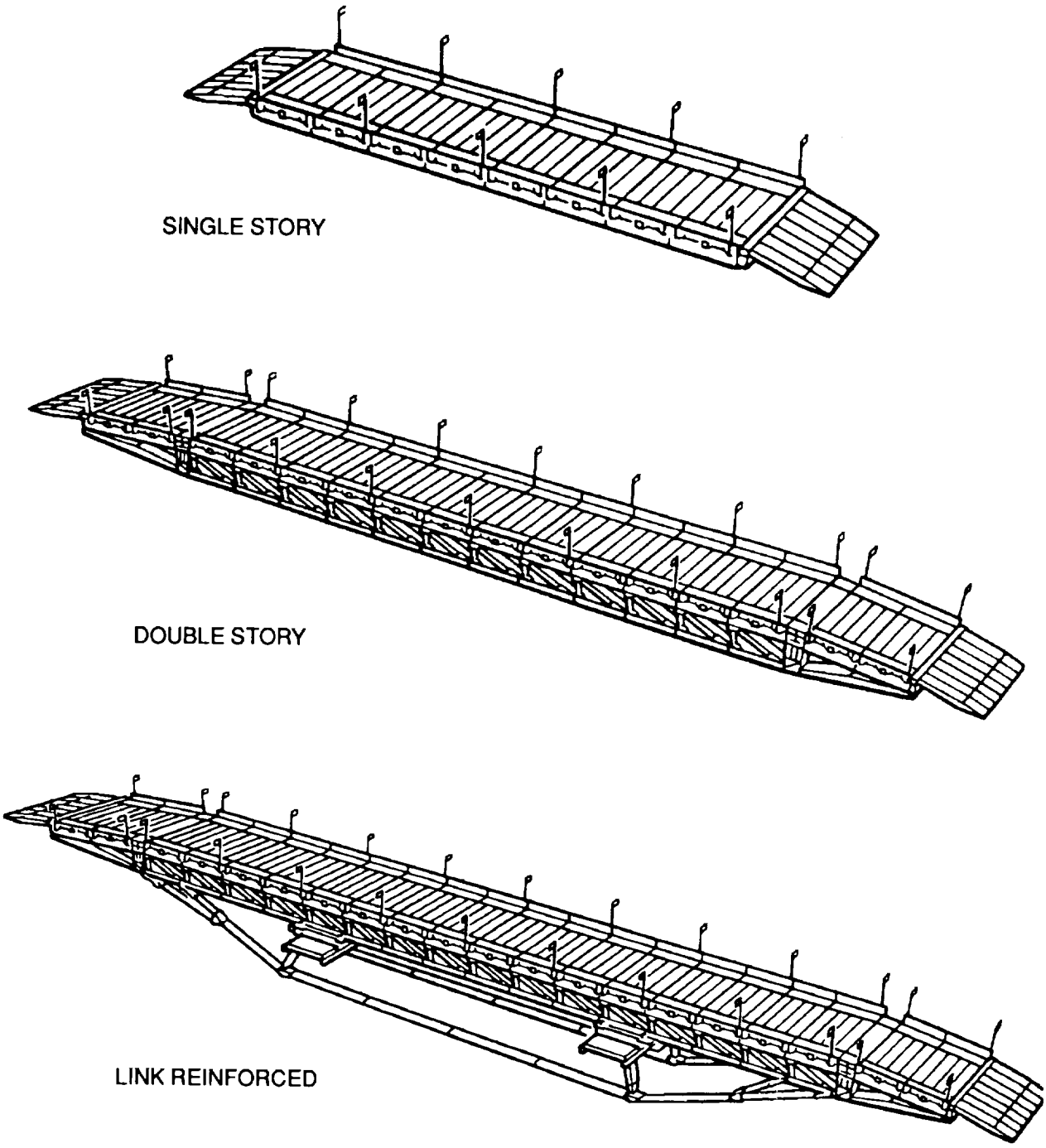


FIGURE 1-1. MGB

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION.

1-1. SCOPE

This manual is written to cover all levels of expertise in the use and operation of Medium Girder Bridge (MGB). The instructions provided in Chapters 1 to 7 cover description of components and every phase of operation of MGB, from design and site selection, through to assembly and disassembly. Operator Maintenance is covered in Chapter 8.

The appendices list reference material, components of end item and basic issue items, additional authorization items, expendable/durable supplies and materials, and pallet and basket loads.

1-2. MAINTENANCE FORMS AND RECORDS

a. ARMY - Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750. The Army Maintenance Management System (TAMMS).

b. MARINE CORPS - Maintenance forms and procedures will be those prescribed by TM4700-15/1.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform.

a. ARMY - Put it on a SF368 (Quality Deficiency Report). Mail it to us at Headquarters Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MDC, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We'll send you a reply.

b. MARINE CORPS - EIR's should be submitted in accordance with MCO 1650.17 directly to: Commander, Marine Corps Logistics Base, ATTN: Code 850, Albany, GA 31704-5000.

1-4. NOMENCLATURE CROSS REFERENCE LIST

COMMON NAME	OFFICIAL NOMENCLATURE
Adjustable Support	Roller Beam Support, Adjustable, Bridge
Anchor Assembly (AA)	Anchor Piece Assembly
Anchorage Pin Assembly	Anchorage Pin Assembly, Mk 2
Anti-Flutter Tackle (AF)	Anti-Flutter Cable Assembly
Bankseat Beam (BSB)	Beam, Bankseat, Bridge
Baseplate (Single Story)	Baseplate, Roller Beam Support
Baseplate (Double Story)	Baseplate, Building Frame, Bridge

COMMON NAME	OFFICIAL NOMENCLATURE
Bottom Panel (BP)	Panel, Bottom, Bridge
Bracing Pin	Pin, Bracing
Bridge Marker Guide	Marker, Bridge, Guide Assembly
Building Pedestal (BP)	Pedestal, Building, Bridge
Capsill	Capsill, Bridging
Capsill Pin	Pin, Capsill
Carrying Bar	Carrying Bar, Bridge Parts
Carrying Handle	Carrying Handle
Curb	Curb, Bridge
Davit Post Assembly	Davit Post Assembly
Deck	Deck Unit, Bridging
End Taper Panel (ETP)	Panel, End Taper, Bridge
Equipment Bag	Bag, Equipment
Equipment Basket	Basket, Bridging, Equipment
Extractor Cable	Extractor, Cable Assembly
Fixed Support	Roller Beam, Support, Fixed, Bridge
Footwalk	Footwalk, Bridge
Footwalk Bearer	Bearer, Footwalk
Footwalk Post	Post, Footwalk, Bridge
Frame Cross Girder	Cross Girder, Building Frame, Bridge
Guard Rope	Rope, Guard
Hammer (Nylon Faced)	Hammer, Hand
Headless Panel Pin	Pin, Panel, Headless
Hydraulic Jack 15T	Jack, Hydraulic, Hand,15 Ton
Hydraulic Jack 20T	Jack, Hydraulic, Hand, 20 Tonne
Jack Hood	Bracket Assembly, Lifting
Jack Post	Post, Jacking, Bridge
Jack Seat	Jack Seating, Building Frame, Bridge
Jack Support	Support, Jack, Bridge

COMMON NAME	OFFICIAL NOMENCLATURE
Jacking Bracket	Bracket Assembly, Jacking
Junction Panel (JP)	Panel, Junction
Landing Roller (LR)	Roller, Landing, Bridge
Landing Roller Pedestal Mk 1 (LRP)	Pedestal, Landing Roller, Adjustable, Bridge Mk1
Landing Roller Pedestal Mk 2 (LRP)	Pedestal, Landing Roller, Adjustable Bridge Mk2
Launching Nose Cross Girder (LNCG)	Cross Girder, Launching Nose, Bridge, Mk 3
Launching Nose Cross Girder Post	Post, Launching Nose, Cross Girder (Special)
Launching Nose Heavy (LNH)	Launching Nose Unit, Heavy, Bridge
Launching Nose Link (LNL)	Link, Launching, Two Tier
Launching Nose Pin	Pin, Launching Nose
Launching Nose Roller (LNR)	Roller, Launching Nose, Bridge, Mk 2
Lifting Sling	Sling, Multiple Leg
Light Launching Nose Front (LLNF)	Launching Nose Unit, Light, Bridge, Front
Light Launching Nose Rear (LLNR)	Launching Nose Unit, Light, Bridge, Rear
Light Tackle (LT)	Tackle, Light
Long Ramp	Ramp Unit, Special
Long Reinforcing Link	Link, Reinforcing, Long
Longitudinal Girder	Longitudinal Girder, Building Frame, Bridge
Packing Timber	Packing, Timber
Pallet	Pallet Assembly
Pallet Adapter	Adapter Assembly, Pallet To Trailer
Panel Erection Aid	Panel Erection Aid, Bridge
Panel Pin	Pin, Panel
Post Tensioning Assembly (PT)	Post Tensioning Assembly, (Short Post)
Puller	Puller, Ratchet Lever, Cable Type
Push Bar Adapter	Adapter Assembly, Push Bar
Push Bar Cross Girder (PBCG)	Cross Girder, Push Bar, Bridge

COMMON NAME	OFFICIAL NOMENCLATURE
Push Bar Long (PB)	Push Bar, Long, Launching, Bridge
Push Bar Short (PB)	Push Bar, Short, Launching, Bridge
Ratchet Wrench 3/4 inch	Wrench, Ratchet, Reversible 3/4 inch
Retainer Clip	Clip, Panel Pin
Rocking Roller	Roller Assembly, Rocking, Bridge
Roller Beam (RB)	Roller Beam, Bridge
Rubber Buffer	Pallet, Rear Buffer Assembly
Short Ramp	Ramp Unit, Bridge
Short Reinforcing Link	Link, Reinforcing, Short
Strap, 5,000 lb	Strap 5,000 lb
Strap, 10,000 lb	Strap Webbing 10,000 lb
Sway Brace	Brace, Sway
Tie-Down Lug	Lug, Tie-Down
Top Panel (TP)	Panel, Top, Bridge
Trailer Mounting Equipment	Trailer Mounting Equipment
Truck Mounting Equipment	Truck Mounting Equipment

1-5. LIST OF ABBREVIATIONS

A	=	Junction panel in far bank end of bridge
A	=	Edge of gap, far bank, marked with A peg
A’	=	Edge of gap, near bank, marked with A’ peg
AA	=	Anchor assembly, component in link reinforcement set
AA(L)	=	Anchor assembly, long.
AA(S)	=	Anchor assembly short
AF	=	Antiflutter tackle
approx.	=	approximately
AR	=	Angle of repose which is marked on site with A (far bank) and A’ (near bank) pegs
atten.	=	attention
B	=	Top panel in the far bank end of bridge, on the bank side of the junction panel
BP	=	Bottom panel. This will also be found with number following BP: Examples: BP1, BP2,
BP	=	Building pedestal
BSB	=	Bankseat beam
C	=	Top panel in the far bank end of bridge, on the bank side of the bankseat beam
C	=	Distance of water below line joining FRB and F at distance W from FRB (negative)
CL	=	Centerline
cm	=	centimeter
CRB	=	Capsill roller beam
d1/d2	=	Gaps between level string and top panels when checking girder toe in

D	=	Junction panel in near bank end of bridge
D	=	Deflection of bridge during launch In relation to line joining FRB and F peg
del	=	delaunch
dist	=	distance
DS	=	Double story
DS	=	Direct Support
DSB	=	Double story bridge
DSC	=	Double story center pallet load
DSM	=	Direct Support Maintenance
DU	=	Deck unit
E	=	Used in text to describe end of bridge
E	=	Top panel in the near bank end of bridge, on the bank side of the junction panel
EIR	=	Equipment Improvement Recommendations
elev	=	elevation
EOB	=	End of bridge (used in describing types of loads). Examples: EOB1, EOB2
ES/ED	=	Erection single/erection double pallet load
ESC	=	Equipment Serviceability Criteria
ETP	=	End taper panel
F	=	Top panel in the near bank end of bridge, on the gap side of bankseat beam
F	=	Final position of the far end of bridge, marked with F peg
F’	=	Final position of the near end of bridge, marked with F’peg
FB	=	Far bank
FRB	=	Front roller beam
ft	=	foot (feet)
G	=	Distance between 0 peg and baseline
g	=	gram
GAA	=	Grease Automotive and Artillery
gal	=	gallon
gm/m2	=	grams per meter squared
H	=	Far bank height at F peg, relative to the baseline
Ht	=	height
in	=	inch (inches)
JP	=	Junction panel
kg	=	kilogram
L	=	Length of bridge (excluding ramps)
LAU	=	Launch of balance point of bridge to roller beam closest to the edge of gap, and all further moves of bridge during construction. Used in building and booming tables only
LAU	=	Launch
lb	=	pound
LLN	=	Light launching nose
LNCG	=	Launching nose cross girder
LNH	=	Launching nose heavy
LNL	=	Launching nose link
LNR	=	Launching nose roller
LR	=	Landing roller
LRD	=	Long ramp and deck pallet. This is last pallet to be off-loaded on a bridge site. Should be loaded onto a push vehicle to maintain a proper counterweight
LRP	=	Landing roller pedestal
LRS	=	Link reinforcement set
LRS-1	=	Link reinforcement set pallet load
LRS-2	=	Link reinforcement set pallet load
LT	=	Light tackle
LZ	=	Landing zone
m	=	meter
MAC	=	Maintenance Allocation Chart
max	=	maximum

MGB	=	Medium girder bridge
min	=	minimum
MLC	=	Military load class
mm	=	millimeter
mps	=	meters per second
MWO	=	Modification Work Order
N	=	Nose tip height above baseline
N1	=	Launching nose heavy, one story high
N2	=	Launching nose heavy, two stories high
NB	=	Near bank
NCO	=	Noncommissioned officer
NSN	=	Nato Stock Number
O	=	Distance R from RB (single story), FRB (double story) and CRB (double story with or without LRS) as marked with the 0 peg
oz	=	ounce
oz/yd2-	=	ounces per square yard
PB	=	Push bar
PBCG	=	Push bar cross girder
PMCS	=	Preventive Maintenance Check and Services
PT	=	Post tensioning assembly
R	=	Maximum distance from the rear of the front or capsill roller beam, required for construction (excluding push bar and vehicle)
RB	=	Roller beam
RBSB	=	Rear bankseat beam
rcvr	=	recover
rem	=	remove
RRB	=	Rear roller beam
SRDC	=	Short ramp deck and curb, pallet load
SSB	=	Single story bridge
SSC	=	Single story center, pallet load
SSE	=	Single story end, pallet load
T	=	ton
T	=	Height of near bank end of bridge in relation to baseline
TAMMS	=	The Army Maintenance Management System
TBP	=	Temporary building pedestal
thru	=	through
TM	=	Technical Manual
TP	=	Top panel
V	=	For delaunching purposes, the maximum allowable distance between the FRB or CRB to the LRP for bridges requiring a launching nose
W	=	Distance of end taper panel from FRB or CRB for maximum deflection
WL	=	waterline
wt	=	weight
yd	=	yard
1LL	=	One long reinforcing link
1SL	=	One short reinforcing link

1-6. GLOSSARY

Abbreviations	Explanation
AR Span	The distance between the angle of repose pegs on home and far banks.
AR Gap	The distance from the edge of firm ground (A') on the near bank to the edge of firm ground (A) on the far bank.

Bays	6 ft (1.8 m) panel length. In single story construction: all panels between the bankseat beams. In double story construction: all panels between junction panels.
Boom Marker	Carrying bar (painted orange) which marks the positioning of the next booming or launching point.
Boom To	Movement of bridge until panel point given is over RB (for SS) or RRB (for DS).
Bight	A loop of rope.
Cantilever	A beam or girder fixed only at one end.
CG Marker	Carrying bar (painted blue) which marks the center of gravity of the bridge during construction.
Launch To	Movement of bridge until panel point given is over RB, FRB or CRB.
Off Load	Pulling a loaded pallet off vehicle or trailer on to the ground.
Reeve	To pass a rope or cable through a block or pulley.
Unload	Remove strapping and components from a pallet.
6N1, 7N1 and 8N1	Types of single-story nose construction. The first number shows the number of heavy nose sections used. The N1 means single-story nose.
6N1 + 3N2	Type of double-story nose construction. The 6N1 Is explained above. The 3N2 means that three heavy nose sections are used in second-story. The N2 means double-story nose.
2, 3, or 8 thru 1 0	Describes number of bays to be added or removed. The 2, 3, means add second and third bays, or remove third and second bays if numbers reversed, 3,2. Similarly the 8 thru 10 means add bays 8 through 10, or remove bays 10 thru 8 if reversed.
30, 80, 200, 270 +8C and 37D + 6C	Counterweight codes giving the number of deck units and curbs used.
(4p0), (2p), and (Bp3)	Examples of the way that the center of gravity (CG) is shown.

Section II. EQUIPMENT DESCRIPTION

1-7. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

a. The Medium Girder Bridge (MGB) is a two girder deck bridge. The wide upper surfaces of the girders, and the deck units laid between them form a roadway 13 ft 2 in (4.0 m) wide. The girders can be constructed in two forms: a shallow single story construction as shown in Figure 1-2, or a deeper double story construction as shown in Figure 1-1. The double story can be reinforced by adding components of the Link Reinforcement Set (LRS) as shown in Figure 1-4; this permits longer Military Load Class (MLC) 70 bridges to be constructed.

The maximum load capabilities of single story, double story and link reinforced MGB are given in Table 1-1. The Military Load Class (MLC) for each length of bridge is shown in Table 3-6.

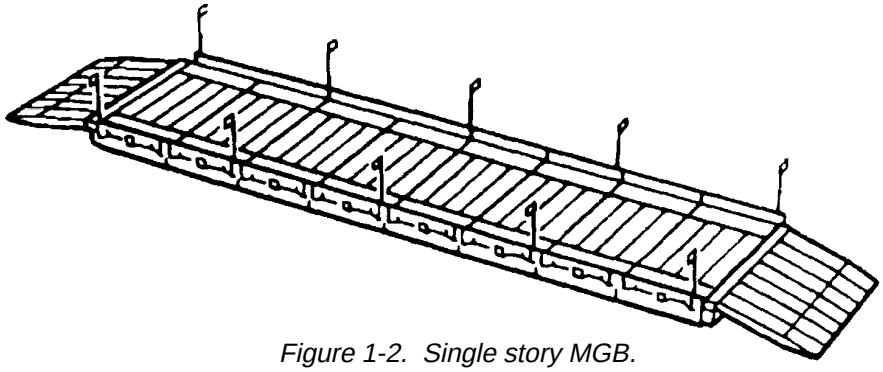


Figure 1-2. Single story MGB.

b. The two grinders are constructed from a number of panels pinned together, and are separated by two bankseat beams, one pinned to each of the girders. The roadway is formed by hanging deck units between the girders and connecting ramps to each end. Curbs and guide markers are placed at the outside edges of the girders to mark the edge of the bridge. The single story bridge is used for light loads, for example it will carry MLC 70 (tracked) up to 32ft (9.8m) decreasing to MLC16 at 74ft (22.6m).

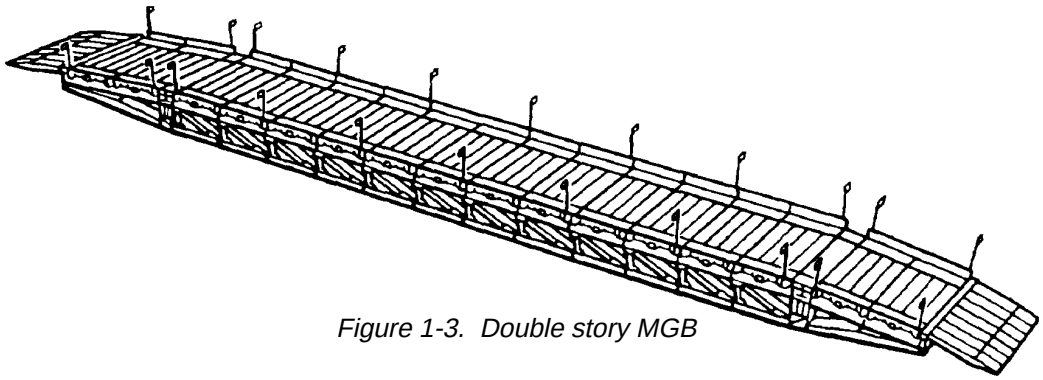


Figure 1-3. Double story MGB

NOTE

The U.S. junction panel is slightly longer than standard, therefore the bridge lengths quoted below for double story and link reinforced bridges are "nominal" lengths.

c. A double story bridge (DSB) uses all of the parts of a single story bridge (SSB) which are pinned on top of triangular bottom panels, with junction panels and end taper panels at each end. These parts make the

bridge stronger. For example a double story bridge will carry MLC 70 (T) over a length of 102 ft (31.1 m) decreasing to MLC 16 at 162 ft (49.4 m).

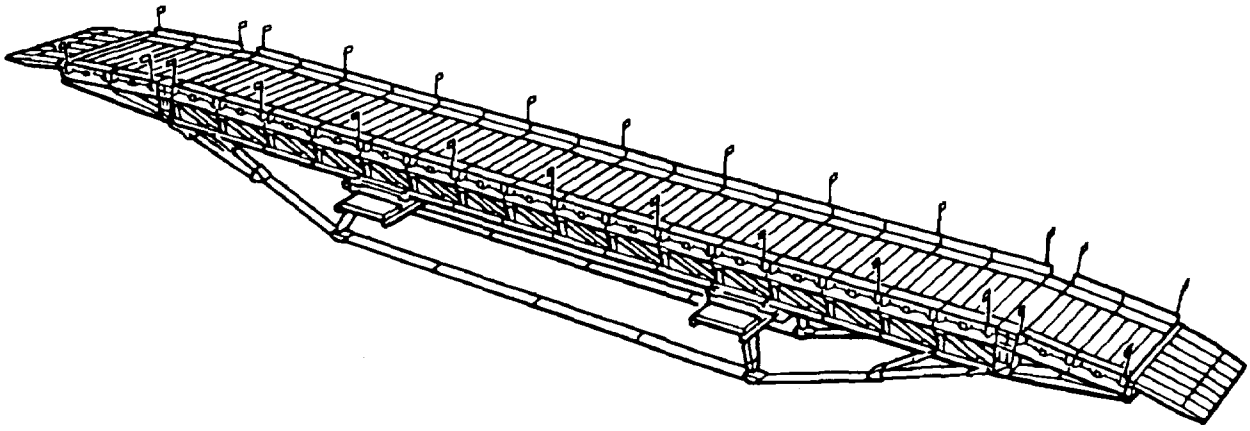


FIGURE 1-4. Link reinforced MGB.

d. The Link Reinforcement Set (LRS) extends the single span capability of the MLC 70 MGB. The set contains all the components needed for use with two bridge sets to construct any length of reinforced MLC 70 (T) MGB up to 150ft (45.7 m) and MLC 60 (T) up to 16211 (49.4 m). The LAS consists of reinforcing links 12ft (3.66 m) and 6 ft (1.83 m) long which are connected to form a pair of link chains, one beneath each bridge girder. The 6 ft (1.83 m) links are provided for use in bridges that have an odd number of bays.

e. Link reinforcement is added to the bridge during normal bridge construction. The size of the work party is increased from 24 to 32 personnel and this permits addition of the LAS to the bridge without a considerable increase in construction time. A capsill roller beam (CAB) is used when constructing 2E + 13 through 22 bay bridges with link reinforcement. The end anchor and links are added to the bridge as the bottom panels pass the CAB. Additional reinforcement is added as the bridge is boomed forward. When all reinforcement is in place, the bridge can be jacked down. Before decking and ramping, the reinforcement is tensioned using the cable pullers.

f. The link chains are connected to the bottom panels at the ends of the bridge by an anchor assembly, positioned below the bridge girders by reinforcing posts which allow the system to be tensioned. The posts are pulled towards a vertical position by cable pullers. The pullers are fitted to frames in which the top of the posts can slide, then the posts are pinned at fixed points providing the correct tension. The amount of tension is the minimum needed to remove slack from the bridge and reinforcement set.

WARNING

The MGB cannot be used when bridging requirements exceed the capabilities given in Table 1-1.

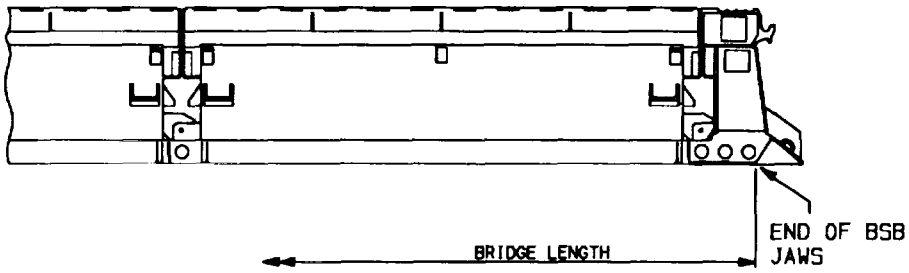
g. Table 1-1 gives MGB's specific capabilities, and Tables 1-2 1-3 and 1-4 give bridge lengths for 1-9 specified gap widths.

1-8. BRIDGE LENGTH

The MGB bridge length figures quoted in this manual are governed by the Quadripartite Standardization Agreement (QSTAG). The bridge length is defined as the distance between the extreme ends of the bearing areas on each chord. The bridge length figures quoted throughout this manual are NOMINAL lengths which make allowance for the effect of deflection on the bridge and launching nose during launch, and the effect of live load during use. As the nominal length is slightly less than the actual, it will be expected that, when the bridge is in place, it may overlap the A and F pegs (para. 3-12f) by a few inches.

a. Single Story

For single story bridges the bridge length is measured between the ends of the bankseat beam jaws.



b. Double Story with and without LRS

For double story bridges, with and without reinforcement, the bridge length is measured between the ends of the end taper panels.

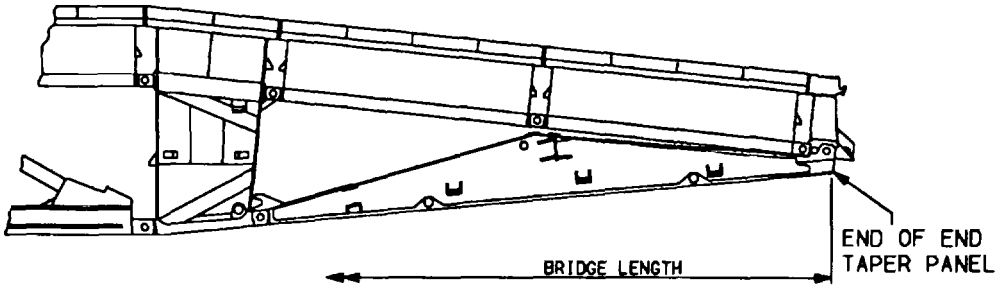


TABLE 1-1. Bridge Length v Maximum Load Capability

BRIDGE	MLC (Note 1)	BRIDGE LENGTH Feet (Meters) (Note 2)	MAX. TRANSVERSE SLOPE UNLOADED	MAX. FULL LOAD CROSSINGS (Note 2)
SINGLE STORY	60 70(Tracked) 100(Wheeled)	32 (9.8) 32 (9.8) 32 (9.8)	1/10 1/20 0	10,000 5,000 7,500
DOUBLE STORY	60 60(T) 70(T) 100(W)	102 (31.1) 108 (32.9) 102 (31.1) 90 (27.4)	1/20 1/20 1/20 0	10,000 7,500 5,000 3,000
LINK REINFORCED	60 70(T) 70(T) 100(W)	162 (49.4) 150 (45.7) 162 (49.4) 102 (31.1)	1/20 1/20 0 0	10,000 10,000 5,000 --

NOTES:

1. Deck width is 13 ft 2 in (4 m). In MLC 70(T) & MLC 100(W) configurations the bridge width should be indicated by a sign as shown in STANAG 2010.
2 MLC 100(W) span has yet to be confirmed by tests. See OSTAG 418.

TABLE 1-2. Single Story Bridge Length v Gap Width

BRIDGE LENGTH		No. OF BAYS	MINIMUM GAP WIDTH		MAXIMUM GAP WIDTH	
FEET	METERS		FEET	METERS	FEET	METERS
26	7.9	4	12	3.7	23.4	7.1
32	9.8	5	18	5.5*	29.4	9.0
38	11.6	6	24	7.3*	35.4	10.8
44	13.4	7	30	9.1*	41.4	12.6
50	15.2	8	36	11.0	47.4	14.4
56	17.1	9	42	12.8*	53.4	16.3
62	18.9	10	48	14.6*	59.4	18.1
68	20.7	11	54	16.5	65.4	19.9
74	22.6	12	60	18.3*	7.4	21.8

* Due to rounding figures to one decimal point, these figures are different to those found in Chapter 3

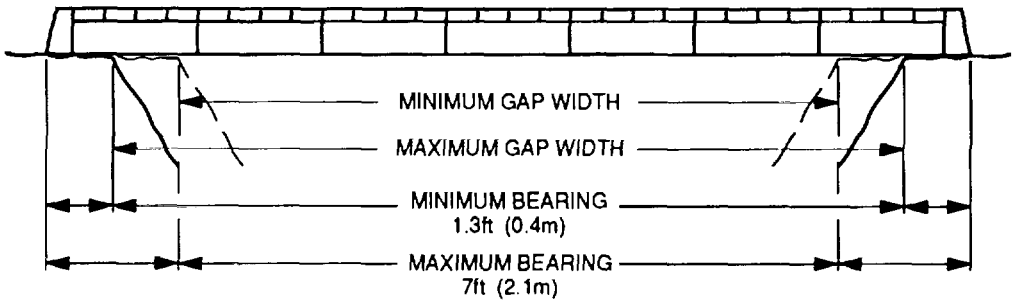


TABLE 1-3. Double Story Bridge Length v Gap Width

BRIDGE LENGTH		2E + No. OF BAYS	MINIMUM GAP WIDTH		MAXIMUM GAP WIDTH	
FEET	METERS	**	FEET	METERS	FEET	METERS
36	11.0	1	21	6.4	29.5	9.0
42	12.8	2	27	8.2	35.5	10.8
48	14.6	3	33	10.0	41.5	12.6
54	16.5	4	36	11.9	47.5	14.5
60	18.3	5	45	13.7	53.5	16.3
66	20.1	6	51	15.5	59.5	18.1
72	21.9	7	57	17.3*	65.5	19.9*
78	23.8	8	63	19.2	71.5	21.8
84	25.6	9	69	21.0	77.5	23.6
90	27.4	10	75	22.8*	83.5	25.4*
96	29.3	11	81	24.7	89.5	27.3
102	31.1	12	87	26.5	95.5	29.1
108	32.9	13	93	28.3	101	30.9
114	34.8	14	99	30.2	108	32.8
120	36.6	15	105	32.0	112	34.6
126	38.4	16	111	33.8	119	36.4
132	40.2	17	117	35.6	125	38.2
138	42.1	18	123	37.5	131.5	40.1
144	43.9	19	129	39.3	137.5	41.9
150	45.7	20	135	41.1	143	43.7
156	47.6	21	141	43.0	148	45.6
162	49.4	22	147	44.8	151.5	47.4

NOTE:

*** Due to rounding figures to one decimal point, these figures are different to those found in Chapter 3.**

**** Double story and link reinforced bridges are described "2E + No. of Bays" (2 ends of bridge + No. of Bays)**

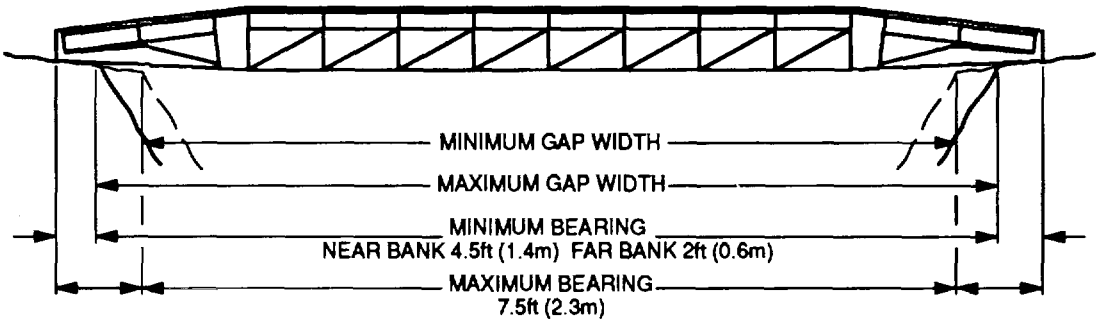


TABLE 1-4. Link Reinforced Bridge Length v Gap Width

BRIDGE LENGTH		2E + No. OF BAYS	MINIMUM GAP WIDTH		MAXIMUM GAP WIDTH	
FEET	METERS	**	FEET	METERS	FEET	METERS
108	321	13	93	28.3	101	30.9
114	34.8	14	99	30.2	108	32.8
120	36.6	15	105	32.0	112	34.1
126	38.4	16	111	33.8	119	36.4
132	40.2	17	117	35.6	125	38.2
138	42.1	18	123	37.5	131.5	40.1
144	43.9	19	129	39.3	137.5	41.9
150	45.7	20	135	41.1	143	43.7
156	47.6	21	141	43.0	148	45.1
162	49.4	22	147	44.8	151.5	46.2

NOTE:
**** Double story and link reinforced bridges are described "2£ + No. of Bays" (2 ends of bridge + No. of Bays)**

a. Work parties recommended for various bridge lengths are given in Table 1-5. Increase or decrease in the size of the work party will, in most cases, considerably increase building times. The number of personnel required for different bridge lengths is the number necessary to assemble/disassemble the bridge in the most efficient manner.

TABLE 1-5. Work Parties for MGB

Bridge Lengths	Work Party
4 and 5 bay (26ft - 7.9m, 32ft - 9.8m) SSB	1 NCO + 8 personnel
6 thru 12 bay (38ft - 11.6m thru 50ft - 15.2m) SSB	1 NCO + 16 personnel
All DSB's	1 NCO + 24 personnel
Anchorage Party for DSB's (if required)	8 personnel
Link Reinforcement Party	1 NCO + 8 personnel

b. Approximate building times for various bridges are given in Table 16. Time is calculated from arrival on site to the opening of bridge.

TABLE 1-6. Building Times (good conditions)

	Single Story			Double Story (without reinforcement)					Double Story (with reinforcement)		
	4-5 Bay	6-8 Bay	9-12 Bay	1-4 Bay	5-8 Bay	9-13 Bay	14-18 Bay	19-22 Bay	13 Bay	14-18 Bay	19-22 Bay
Time by Day (hrs)	½	¾	1	¾	1	1½	1¾	2	2	2¾	3
Time by Night (hrs)	¾	1	1¼	1¼	1½	2	2¾	3	3	4	4½

NOTE:
All timings exclusive of work on approaches.
Add 20 percent for unskilled personnel.
Add 30 percent for inclement weather.
Add 30 percent for adverse site conditions.

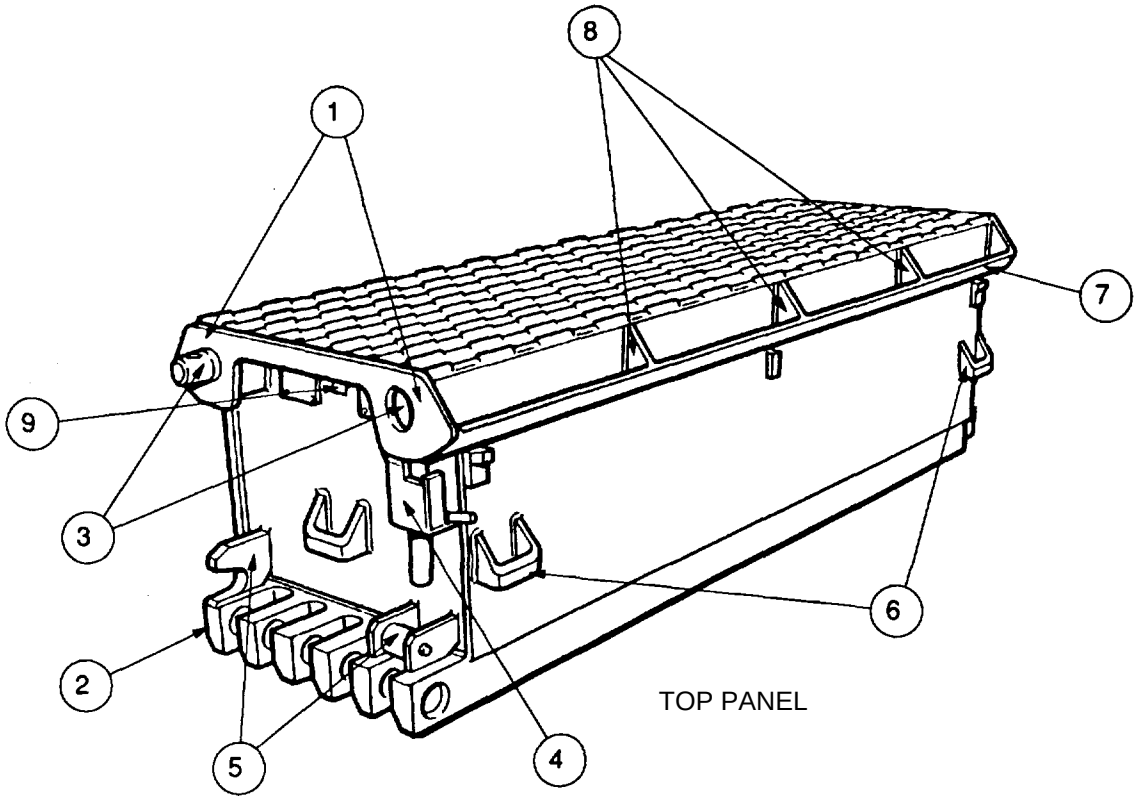
1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

a. Bridge Components. Each bridge component is Illustrated and its function explained.

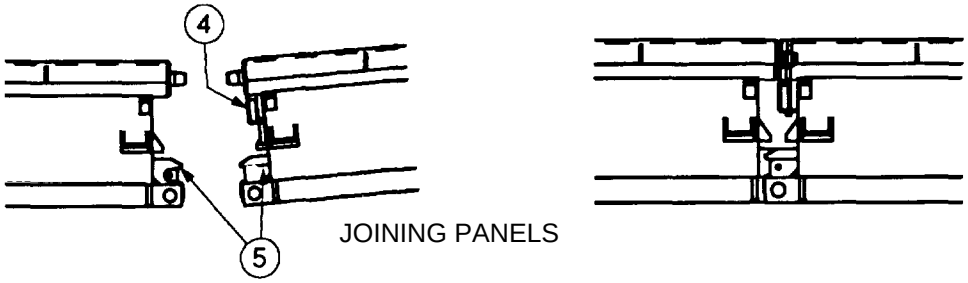
(1) Top Panel (TP)

Top panels form the main girders of the bridge. Top panels, bankseat beams and junction panels have similar dowels, sockets, shoot bolts, compression faces, guide slots, resilient mounts, and pin jaws.

To connect one top panel to another top panel, bankseat beam or junction panel, the dowel and socket is lined up until the compression faces butt together, then the shoot boll handle is lifted and turned to lock the shoot bolt. The rear of the panel is then lowered to allow the resilient mounts to mate in the guide slot and line up the pin jaws. A panel pin is pushed through the pin jaws by hand, and a retainer clip is inserted through the end of the panel pin. The top panel is a non-directional panel and is carried by four personnel.



TOP PANEL



JOINING PANELS

(1) COMPRESSION FACE. Takes compression load when bridge is completed. Used to line up panels, to close shoot bolts.

(2) PIN JAWS. Takes tension load when connected by panel pin to another panel or beam in bridge.

(3) DOWEL AND SOCKET Used to line up panels for connection to each other.

(4) SHOOT BOLT. Holds and locks top of panel to another panel or beam during construction.

(5) RESILIENT MOUNT AND GUIDE SLOT. Used to line up pin jaws so panel pins can be put in by hand.

(6) CARRYING BAR BRACKETS. For connection of carrying bars used to carry panel. One bracket at each end, and two on each side. End brackets used to load/unload panel from pallet, and to lift rear of panel to connect to another panel or beam in bridge. Brackets on side are used to carry panel.

(7) DECK RAIL. Used for placement of deck units and curbs.

(8) DECK SPACER. Separates deck units. Prevents deck units from sliding along bridge.

(9) IDENTIFICATION PLATE. The component serial number is marked on this plate.

CAUTION

DO NOT hammer on shoot bolts or panel pins being inserted into panels. Damage to components may result.

(2) Bankseat Beam (BSB)

The bankseat beam is used to provide and maintain spacing between bridge girders and can support the MGB's maximum bad when bearing anywhere along as length. The BSB connects to top panels or end taper panels and is carried by six personnel.

The parts of the BSB listed below are similar to those of the top panel and perform the same functions.

Compression Face
Shoot Bolt
Resilient Mount and Guide Slot
Pin Jaws
Dowel and Socket
Carrying Bar Bracket

The parts which are special to the bankseat beam, together with their functions, are described below.

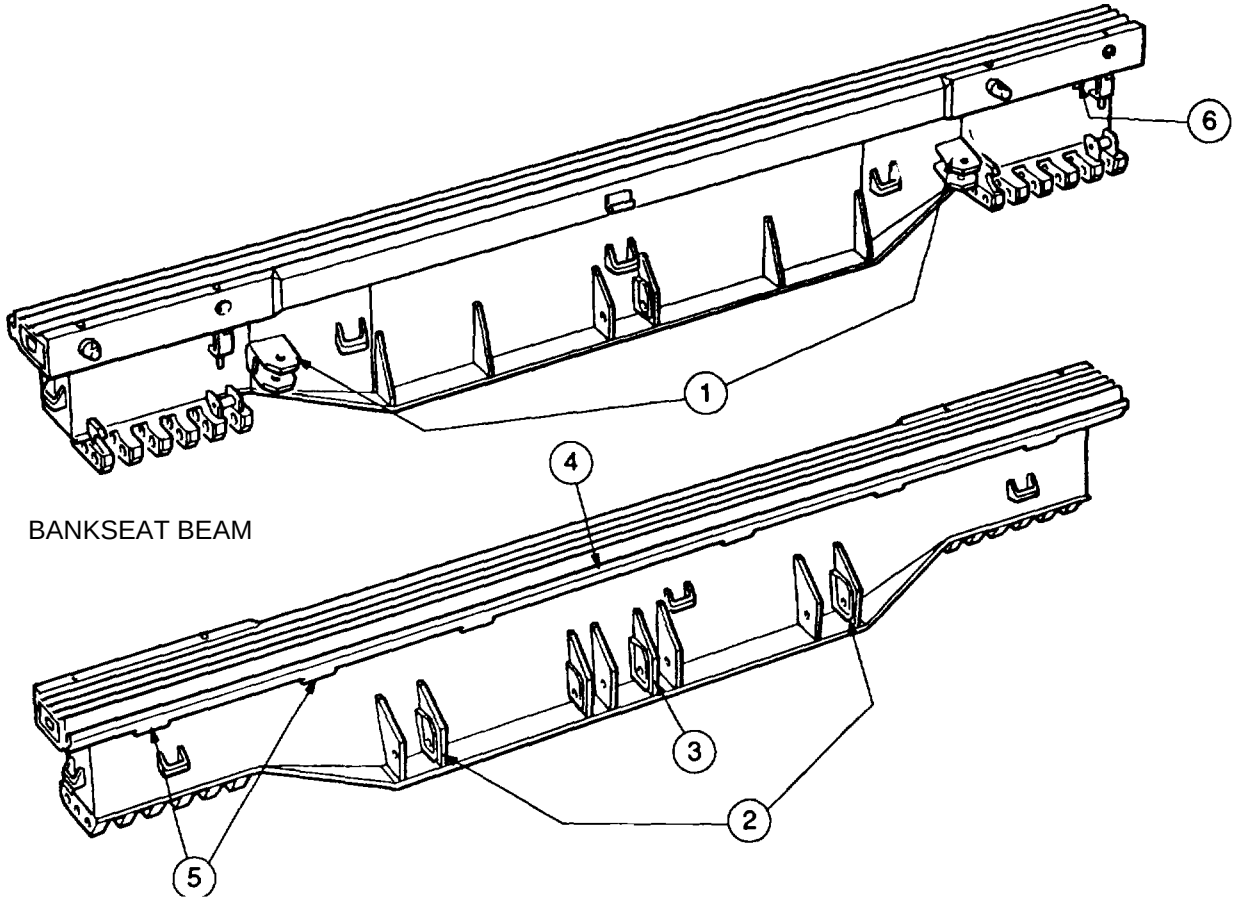
(1) SWAY BRACE BRACKETS. For connection of one end of sway bract bankseat beam. Only one sway brace is connected to bankseat beam.

(2) JACK POST BRACKETS. For connection of jack posts used to raise or lower bridge. Two brackets on outside of beam are used for connection of jack posts and for connection of the jacking bracket links when using davit posts.

WARNING

DO NOT USE bracket on inside of beam. Use of inside bracket can result in injury to personnel or damage to bridge.

(3) CENTER BRACKET. For connection of rear end of light launching nose, launching nose roller, and push bar. Components are connected to this bracket with a launching nose pin.



(4) RAMP SHELF For connection of ramp units to bankseat beam, for connection of jacking bracket links when using davit posts and for connection of launching nose roller.

(5) ANTI-LIFT LUGS. Prevents ramps from lifting off bankseat beam.

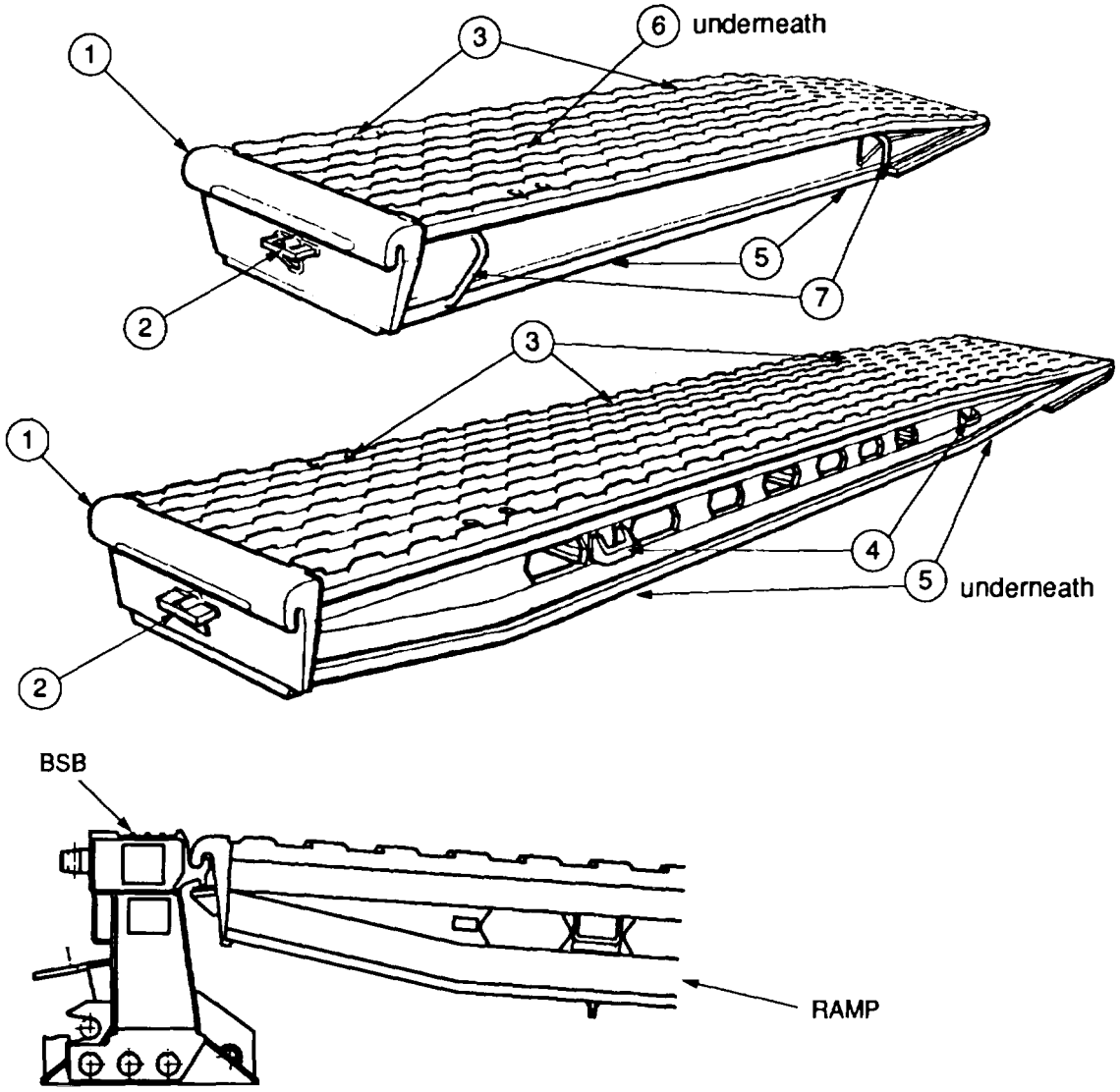
(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

CAUTION

DO NOT hammer on shoot bolts, panel or nose pins being inserted in bank- seat beam. Damage to components may result.

(3) Ramp Unit Short and Long

The ramp unit is used at each end of the bridge and allows vehicles easy access and exit. Seven units are connected to each end. Short ramps are used on single story bridges only. Long ramps can be used on single story bridges, but must always be used on double story bridges. Short ramps are carried by four personnel. Long ramps are carried by four or six personnel.



(1) RAMP HOOK. Fits on ramp shelf of bankseat beam.

(2) ANTI-LIFT LUG. Prevents ramp from lifting off bankseat beam during crossing of traffic.

(3) CARRYING HANDLE HOLES. Pairs of holes on top and to each side of the ramp unit which allow the ramp to be carried using carrying handles. There are four pairs of holes in the short ramp, six pairs in the long ramp.

(4) CARRYING BAR BRACKETS. Long ramps have two carrying bar brackets on each side.

WARNING

DO NOT USE carrying bar brackets as crane lifting points. Serious injury to personnel or damage to bridge may result.

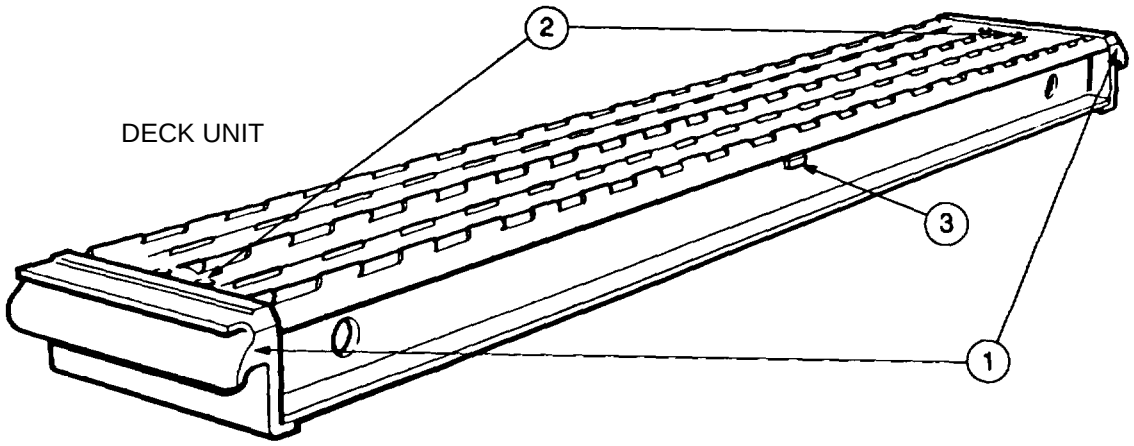
(5) STACKING LUGS. Ramps have lugs on top and bottom that are used for stacking.

(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(7) CRANE LIFTING BRACKETS. Shod ramps have two brackets on each side for lifting of ramps by crane.

(4) Deck Unit

Deck units are placed between the main girders to complete the bridge roadway. Deck units can also be used as a lever to ease pinning or unpinning of the bankseat beam.



(1) RAIL HOOKS. Rail hooks on either end of the deck unit fasten over the top panel deck rail, securing the deck unit in place.

(2) CARRYING HANDLE HOLES. Two pairs of holes located at each end of the deck allow the deck unit to be carried using carrying handles.

(3) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(5) Curb

The curb is used to warn drivers of their nearness to the edge of bridge. One curb is fitted on each top panel and is carried by one person.

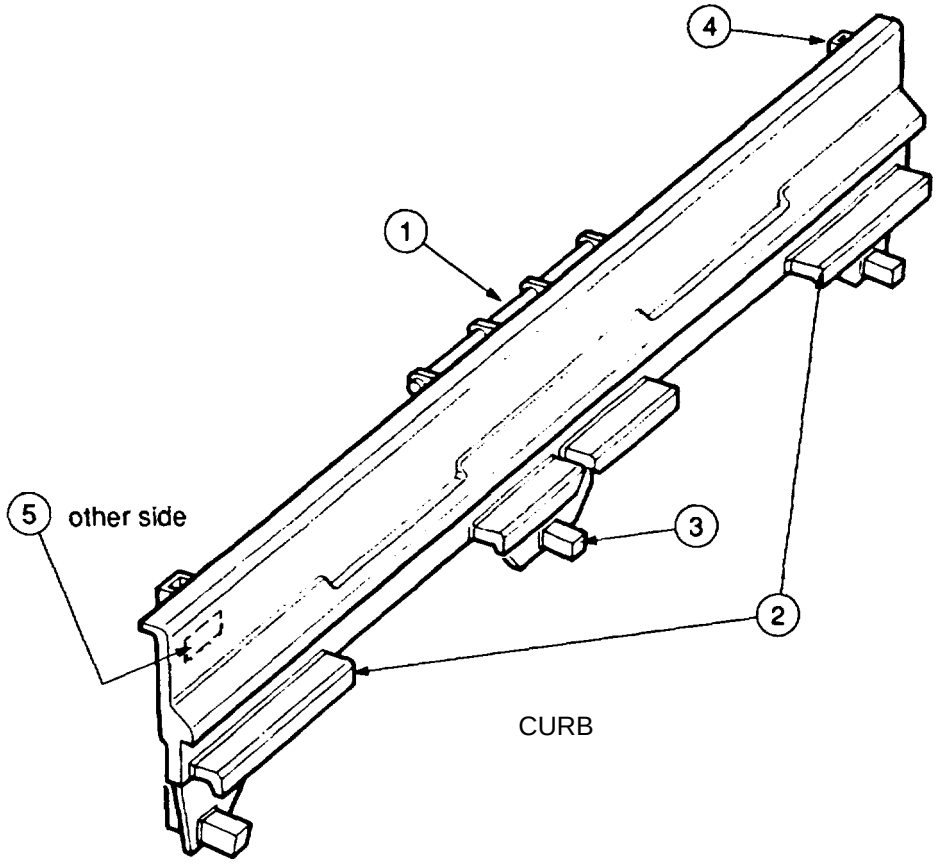
(1) FIXED CARRYING HANDLE. On rear side of curb.

(2) RAIL HOOK. Connects curb to deck rail on top panel.

(3) SUPPORT BLOCKS. Keep curbs in upright position on top panel.

(4) BRIDGE GUIDE MARKER HOLES. Holds guide marker.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.



(6) Bridge Marker Guide

The marker is placed in the hole at the end of a cud), with the panel positioned to the outside of the curb. Markers are placed according to the number of bays (odd or even) in a bridge (as shown below).

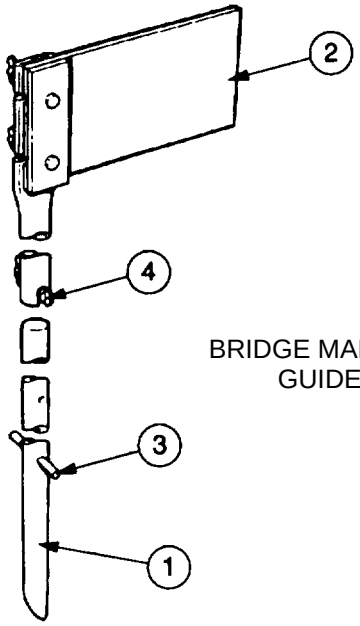
(1) POST Two tubes which telescope to raise or lower marker.

(2) FLAG ASSEMBLY. Reflective white plastic panel attached to top of post.

(3) SUPPORT PINS. Two pins near bottom of post which help to keep post in position.

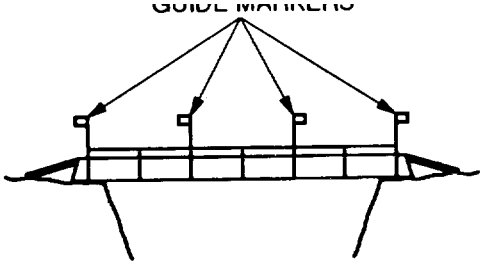
(4) BOLT AND WING NUT. Used to secure post in fully extended position.

NOTE
Remove panels from post before storing markers in baskets.

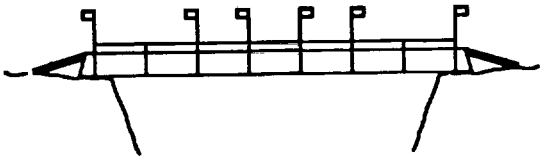


BRIDGE MARKER GUIDE

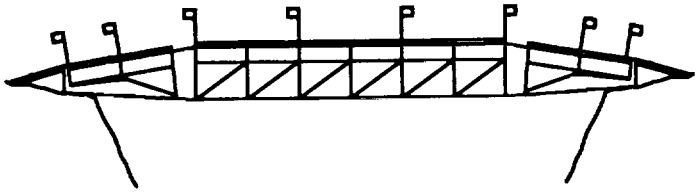
GUIDE MARKERS



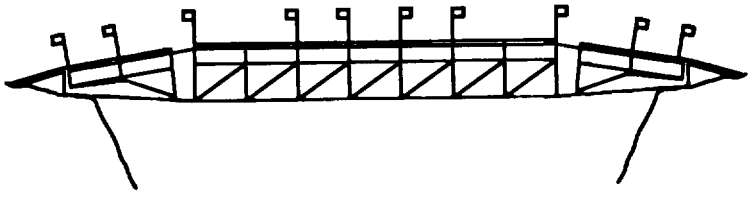
SINGLE STORY - EVEN No. OF BAYS.



SINGLE STORY - ODD No. OF BAYS.



DOUBLE STORY - EVEN No. OF BAYS.



DOUBLE STORY - ODD No. OF BAYS.

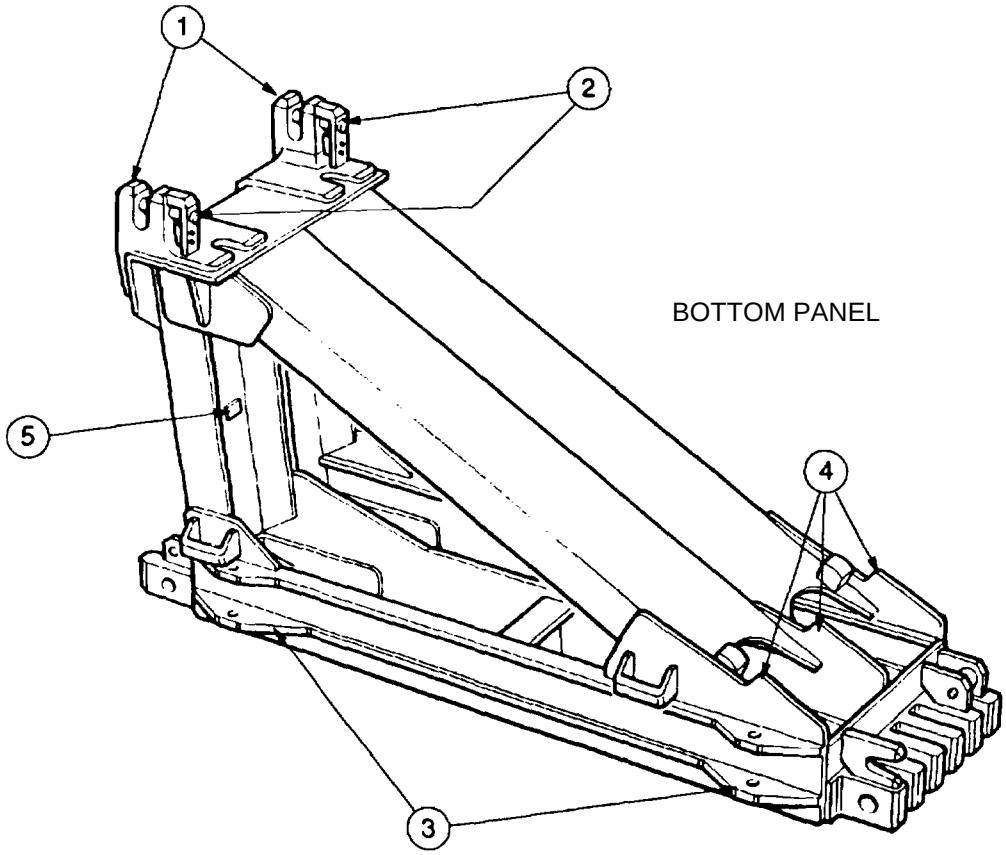
(7) Bottom Panel (BP)

The bottom panel forms a second, deeper girder that is used in double story MGB. The bottom panel's lower pin jaws connect to other bottom panels and junction panels. The upper pin jaws connect to top panels and junction panels. The bottom panel is a directional panel, and the large end always faces the far bank during construction; the panel is carried by four personnel.

The parts of the bottom panel listed below are similar to those of the top panel and perform the same functions.

Carrying Bar Bracket
Resilient Mount and Guide Slot
Pin Jaws

The parts special to the bottom panel, together with their functions, are described below.



(1) TOP JAWS. The top jaws are cradled under the panel pin that fits through the top panel pin jaws.

(2) SHOOT BOLT The shoot boll locks the bottom panel to the top panel by closing over the panel pin. The shoot bolt is engaged and released by hand.

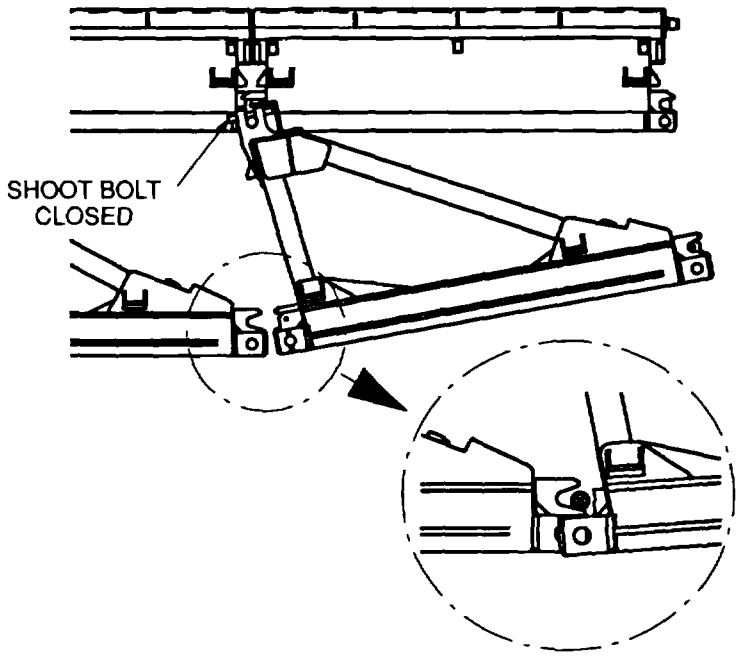
CAUTION
DO NOT hammer on shoot bolt. Damage to component may result.

(3) SWAY BRACE BRACKETS. For connection of sway braces used in double story bridges. There are two brackets on each side.

(4) STACKING PADS. Permits secure and proper stacking of panels for transportation.

(5) IDENTIFICATION PLATES. The component serial number is marked on this plate.

CONNECTING BOTTOM PANELS



(8) Junction Panel (JP)

The junction panel is used in the double story bridge to connect the sloping end of the bridge to the level roadway of the bridge and is carried by four personnel. Curbs are not used on the junction panel.

The parts of the junction panel listed below are similar to those of the top panel and perform the same functions.

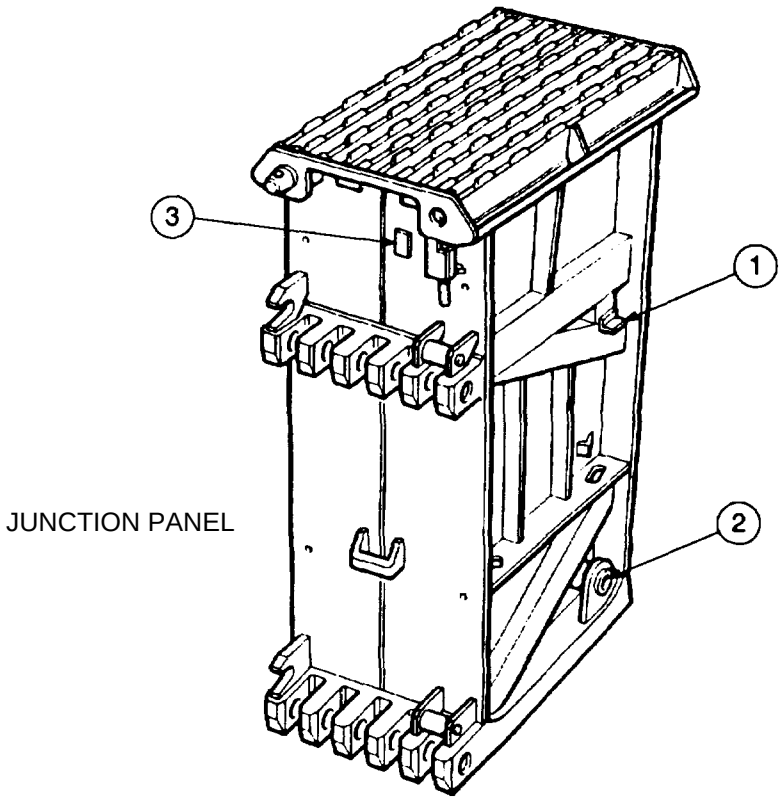
Compression Face
Pin Jaws
Dowel and Socket
Shoot Bolt
Resilient Mount and Guide Slot
Carrying Bar Bracket
Deck Rail
Deck Spacer

The parts special to the junction panel, together with their functions, are described below.

(1) LNCG POST LUG. Used to position launching nose cross girder post.

(2) LNCG POST PIN HOLE. For placement of headless pin to connect launching nose cross girder post.

(3) IDENTIFICATION PLATE. The component serial number is marked on this plate.



NOTE
A headless pin Is always used In the post pin hole.

(9) End Taper Panel (ETP)

The end taper panel is a support brace between the junction panel and the bankseat beam. It provides most of the bearing surface needed for support of the bridge.

No more than 71/2 ft (2.3 m) of the end taper panel can rest on the ground and provide bearing for the bridge. If this limit is exceeded there will be damage to the bridge. The end taper panel is carried by six personnel,

The parts of the end taper panel listed below are similar to those of the top panel and perform the same functions.

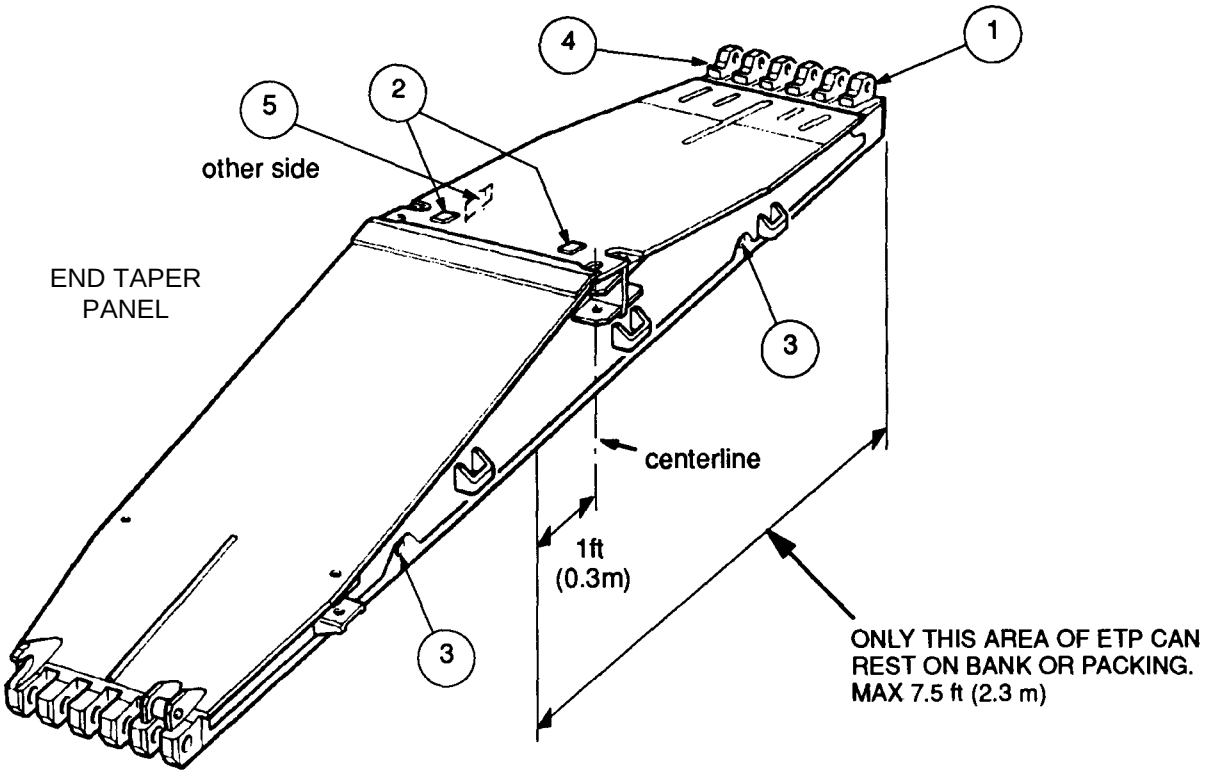
Pin Jaws (Gap End)
Resilient Mount and Guide Slot
Carrying Bar Brackets
Sway Brace Brackets

The parts special to the end taper panel, together with their functions, are described below.

(1) PIN JAWS (Bank End). Connects to pin jaws of bankseat beam. Provides pin seating for guide pin in bankseat beam.

(2) PIN STOPS. Used to position panel pin under top panel before junction panel is put on.

(3) ANCHORAGE PIN HOLES. Used for placement of anchorage pin, and for panel pin used for attaching footwalk bearer.



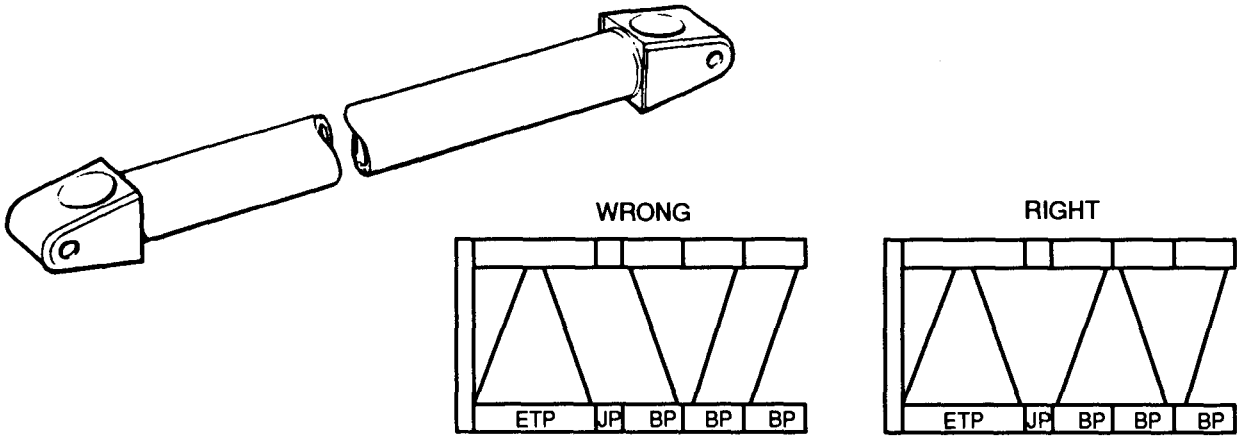
(4) GUIDE PIN SEATING. Used with a panel pin to aid the assembly of end taper panel to the bankseat beam.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(10) Sway Brace

The sway brace is used as a cross member between the bottom panels in girders of double story bridges. It is pinned to sway brace brackets with bracing pins and retainer clips.

CAUTION
DO NOT USE sway braces as levers. Damage to brace may result.



(11) Panel Pin

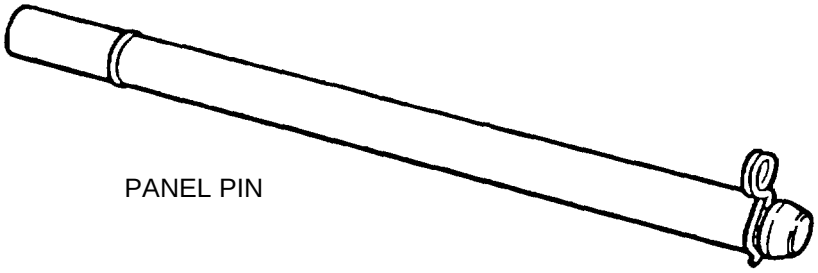
Panel pins are used to connect top panels, bottom panels, junction panels, end taper panels, bankseat beams, and for securing the launching nose through the launching nose roller and anchorage tube. The panel pin has a shoulder at one end and is slotted at the other end. There are holes in the slot for the retainer clip.

All pins are fitted into the bridge by hand from the outside of the girder. When pin jaws, resilient mounts and guide slots are properly mated, the pin can be inserted easily by hand. Retainer clips are put through the hole at the end of the pin for safety. It is not necessary to put a retainer clip through the pin connecting the bankseat beam to the end taper panel, and the pin connecting bottom panel to top panel, but it is good practice to clip all pins to prevent confusion.

When constructing a long DSB (13 thru 22 bay), it is necessary to ensure that retainer clips are placed horizontally through panel pins in the bottom chord of bottom panels.

CAUTION

DO NOT hammer on panel pins. Damage to pin or bridge component may result.



PANEL PIN

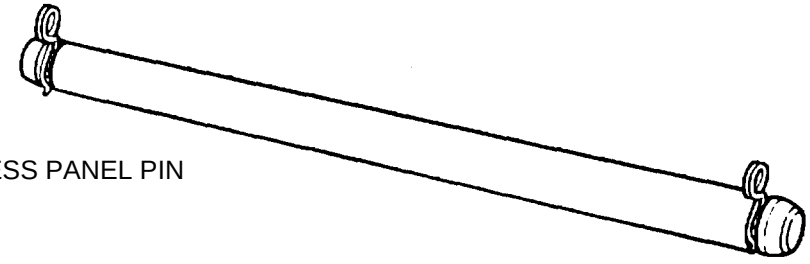
(12) Headless Panel Pin

The headless panel pin is similar to the panel pin except that it has no shoulder and it is slotted at both ends. Being slightly longer and headless, it has a longer reach through component pin jaws.

In the 9 thru 12 bay single story bridge, the headless panel pin is used to connect the top panels of the second and third bay so that the launching nose cross girder posts can be secured at this point.

In the double story bridge, the headless panel pin is used in:

- the post hole on the junction panel for connection of the launching nose cross girder post.
- the pin jaws of the first bay top panel connecting it to the junction panel.
- the top hole of the launching nose link to secure the second story nose to the first story.



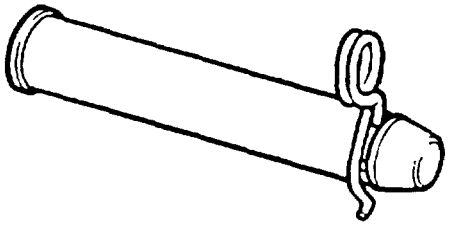
HEADLESS PANEL PIN

(13) Bracing Pin

Used to connect sway braces to sway brace brackets and to connect the push bar to the push bar adapter and push bar cross girder. The bracing pin is also used on the panel erection aid.

NOTE

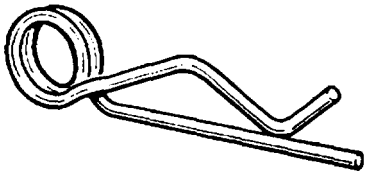
The pin used In the fork end anchors of the IRS anchor assemblies is the only pin that can be hammered on. These pins may be hammered into place using the plastic faced hammer that is provided in the set.



BRACING PIN

(14) Retainer Clip

Retainer clips are inserted through the hole at the end of all pins for safety. It is good practice to clip all pins, even though it is not essential when connecting bankseat beam to end taper panel, and bottom panel to top panel.



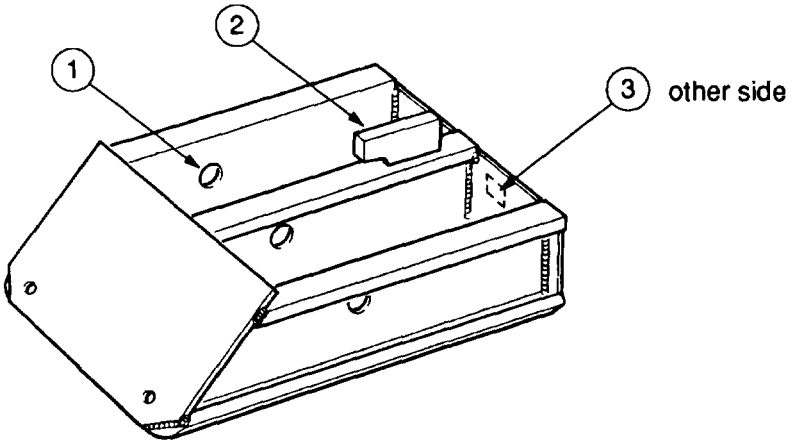
RETAINER CLIP

b. Erection and Launch Components. The erection and launch components are illustrated and the function of each is explained.

(1) Baseplate, Single Story

The baseplate is used under the fixed supports as a base for the roller beam, and with the jack supports as a base for the hydraulic jack. The baseplate can be placed on timber 3 in x 8 in x 36 in (75 mm x 200 mm x 900 mm), or on deck unit packing. The sloping edge always faces the gap.

SINGLE STORY
BASEPLATE



(1) NOSE PIN HOLES. For placement of nose pin used to connect jack support to baseplate.

(2) LUG. Holds fixed support in position.

(3) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(2) Baseplate, Double Story

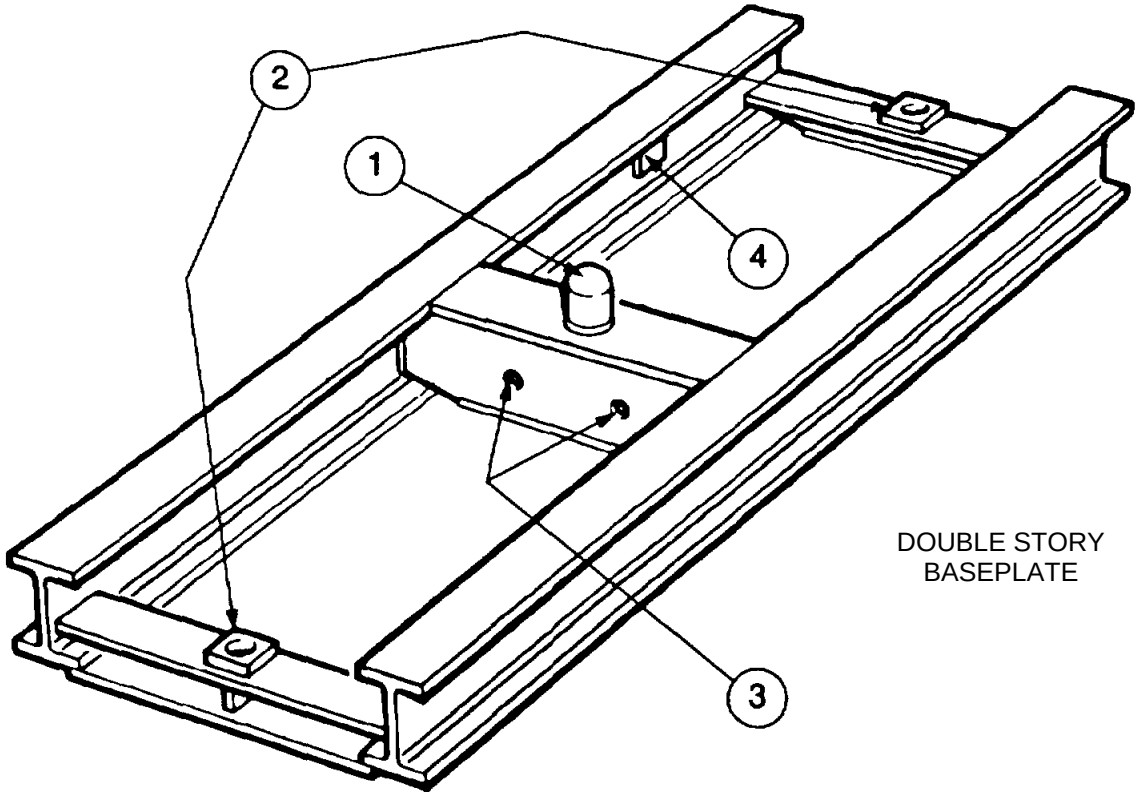
The baseplate is used under the adjustable support as a base for the roller beam; with jack supports as a base for the hydraulic jack to raise or lower bridge, and under the davit post assembly as a base for raising or lowering the bridge. It can be placed on timber 3 in x 8 in x 36 in (75 mm x 200 mm x 900 mm) packing.

(1) BALL. The ball is a pivoting point for the adjustable support. It takes the bridge load from the roller beam and distributes it through the baseplate.

(2) LEVELING SCREW HOLES. Used for positioning of leveling screws in upright position.

(3) NOSE PIN HOLES. For placement of nose pin used to connect jack support.

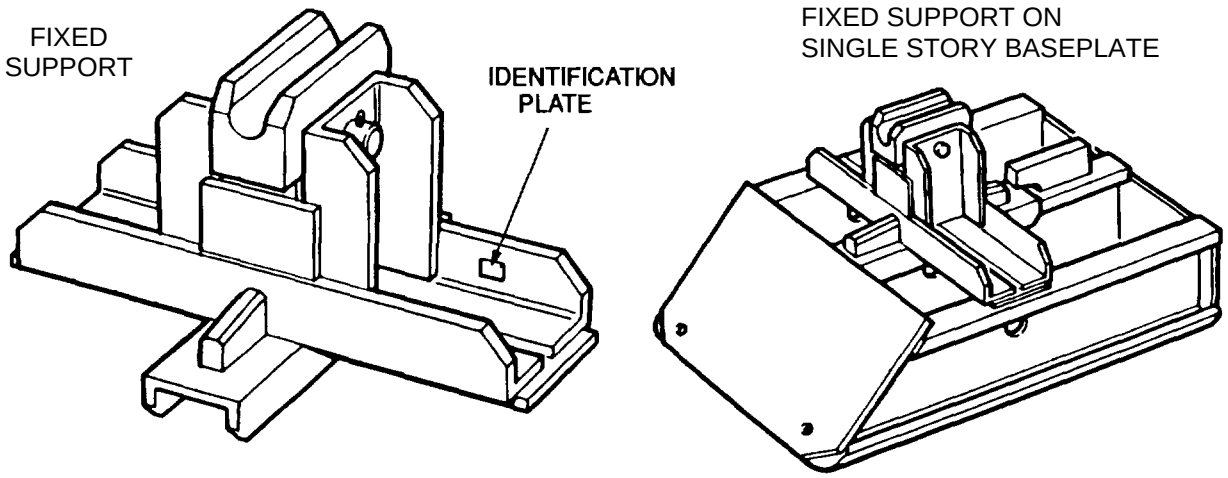
(4) IDENTIFICATION PLATE. The component serial number is marked on this plate.



DOUBLE STORY
BASEPLATE

(3) Fixed Support

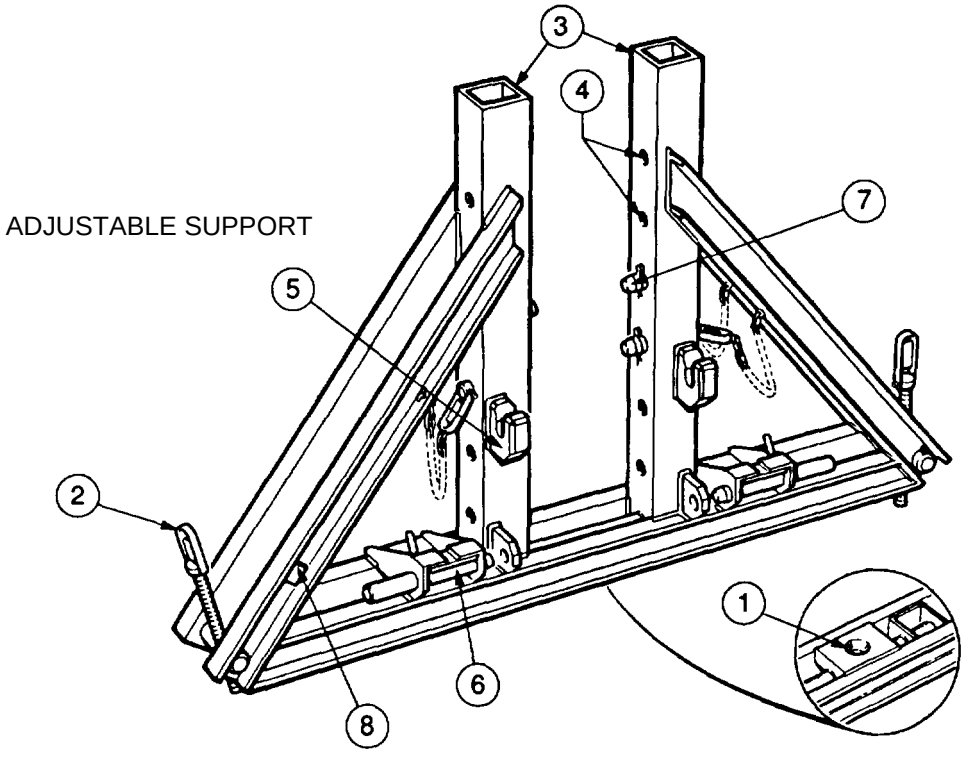
The fixed support, when placed in the single story baseplate, supports the roller beam in the assembly of a single story bridge. The pivoting head permits the roller beam to rock back and forth as needed under the bridge during booming, launching and delaunching.



(4) Adjustable Support

The adjustable support is used in the construction of double story and link reinforced bridges, and supports the roller beam and bridging capsill. It also permits adjustment in the roller beam's height and slope.

In the posts of the adjustable support there are six support pin holes the centers of which are 51/2 in (I 40 mm) apart. These holes are used to support the roller beam/capsill and jack seat during raising and lowering of the beam to various heights. Leveling screws are adjusted to allow the adjustable support to rock 14 in (6 mm) in either direction.



(1) BALL JOINT. Used as pivoting point for adjustable support. Takes load of roller beam and distributes through the baseplate.

(2) LEVELING SCREWS. Used to level adjustable support. Screws should be adjusted to bring the posts as close to vertical as is possible, but with a 1/4 in (6 mm) gap between one leveling screw and the baseplate screw hole.

(3) POSTS. Guides in which the roller bear/capsill can be moved up or down.

(4) SUPPORT PIN HOLES. Used to position roller beam and jackseat at different heights.

CAUTION
Jackseat must not be placed on pins In holes 4, 5, or 6.

(5) HOOKS. For connecting upper part of cross girder to support.

(6) SHOOT BOLTS. For connecting bottom part of cross girder to support.

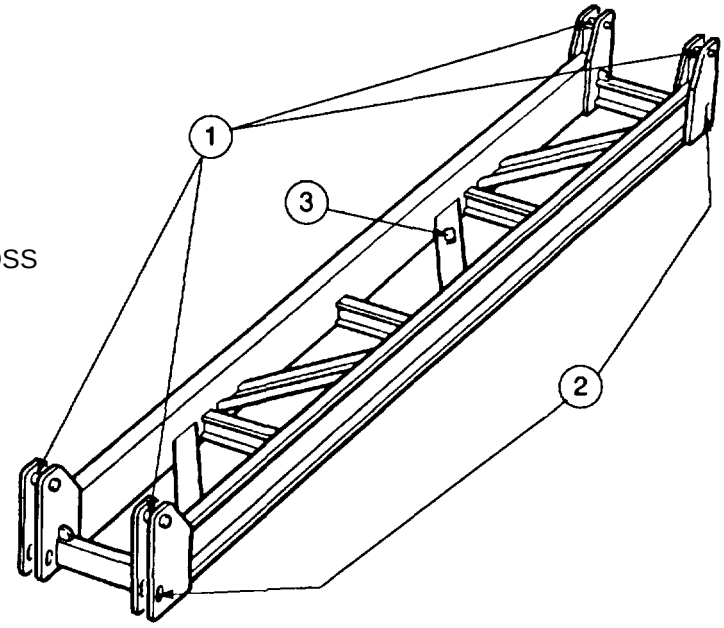
(7) SUPPORT PINS. Two pins on each side of support permit changing height of roller beam/capsill and jack seat.

(8) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(5) Frame Cross Girder

The frame cross girder is used to space and maintain distance between adjustable supports.

FRAME CROSS GIRDER



(1) DOWEL. Fits in hooks on post of adjustable support.

(2) SHOOT BOLT HOLES. Shoot bolts of adjustable support go through these holes to lock girder to support.

(3) IDENTIFICATION PLATE. The component serial number is marked on this plate.

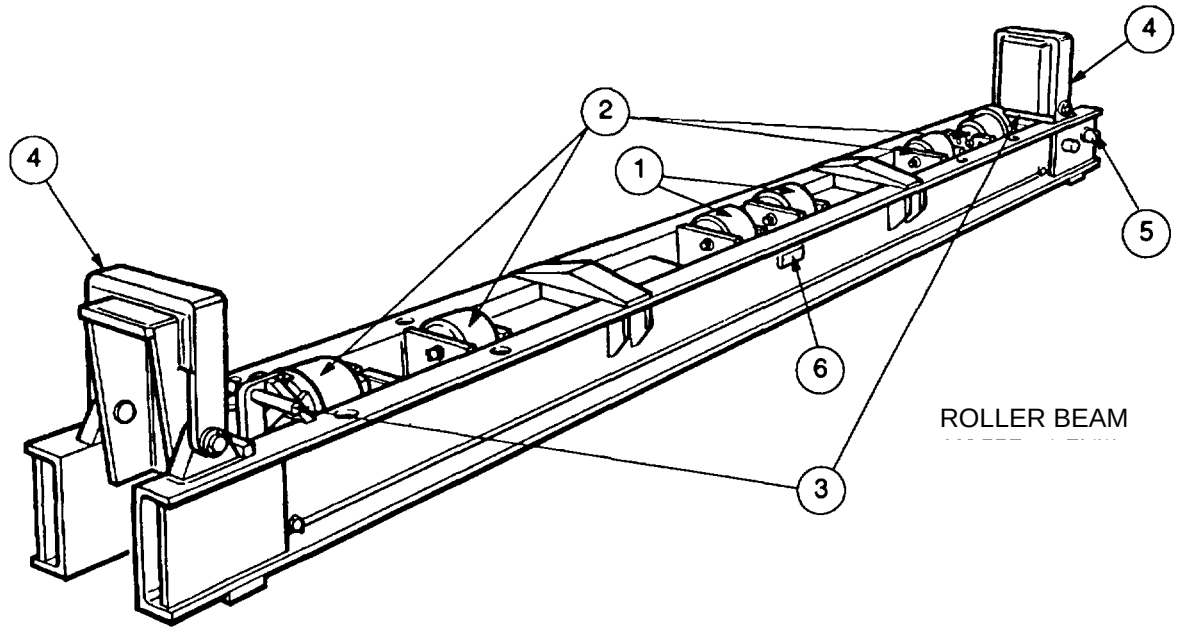
(6) Roller Beam (RB)

The roller beam allows the bridge to be boomed (moved) when needed during construction, and is required for the building of any MGB, regardless of length.

Roller beam is placed on fixed supports for single story, or in adjustable supports for double story and linked reinforced bridges. Ideal conditions (perfectly level ground) will permit placement of the roller beam on the ground or timber packing.

WARNING

Roller catches MUST NOT be engaged when the bridge is moving over the roller beam, otherwise damage to the bridge and roller beams will occur and the roller beam could tip over.



(1) CENTER ROLLERS. Permits light launching nose and bankseat beam to ride over roller beam during single story construction.

(2) OUTER ROLLERS. During MGB construction bridge girders roll over two pairs of outer rollers. The outer roller of each pair is flanged and slotted so that the roller can engage with the roller catch and be locked.

(3) ROLLER CATCH. Used to lock outer flanged rollers.

(4) JACK HOOD. Used in double story construction for placement of hydraulic lack head.

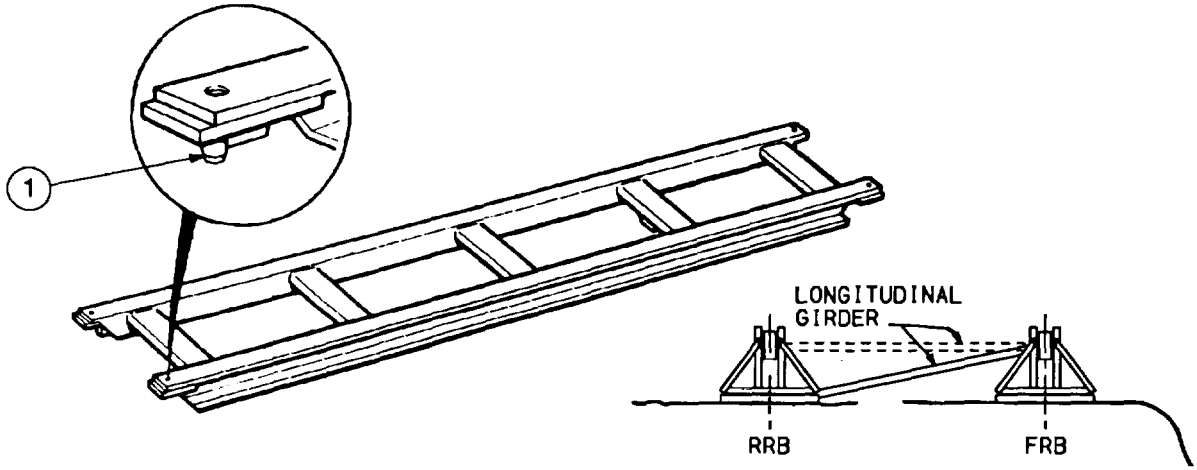
(5) PINS, FIXED AND RETRACTABLE. Used to hold roller beam in adjustable support.

(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(7) Longitudinal Girder

Two longitudinal girders are used to position the rear roller beam 15 ft from the front roller beam and ensure that both roller beams are parallel to each other. The girder also assists in the assembly/disassembly of the end of bridge.

The dowels at the end of the girder are inserted in the holes in both roller beams. When the roller beams are finally positioned the longitudinal girders remain located in the front roller beam but are removed from the rear roller beam and lowered to the ground ready to assist in assembly/disassembly of the end of bridge.

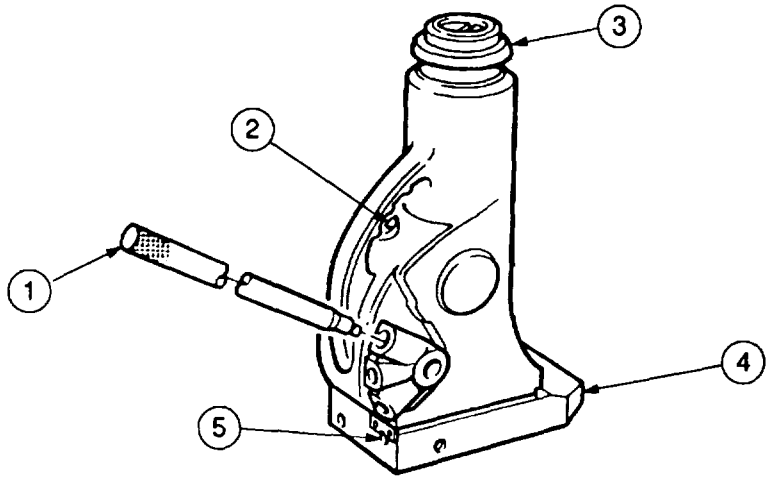


(1) DOWELS. Used to locate the longitudinal girder in the roller beams.

(8) Hydraulic Jack 1 ST & 20T

The hydraulic jack 15T is used in the construction of all single story, and double story MGB's with and without link reinforcement, in the adjustable supports to level the roller beam. It is also used in the landing roller pedestal Mk 1 for single story MGB and double story MGB without link reinforcement, and in the landing roller pedestal Mk1 to raise and lower the far end of the bridge.

The hydraulic jack 20T is used in the landing roller pedestal Mk 2 on double story MGB's with link reinforcement. The jack is identified by its data plate, and silver grey paint.



(1) HANDLE. Used to operate lack to raise ram.

(2) FILLER CAP/DIPSTICK. Used for filling/topping up jack with hydraulic fluid, and for checking fluid level.

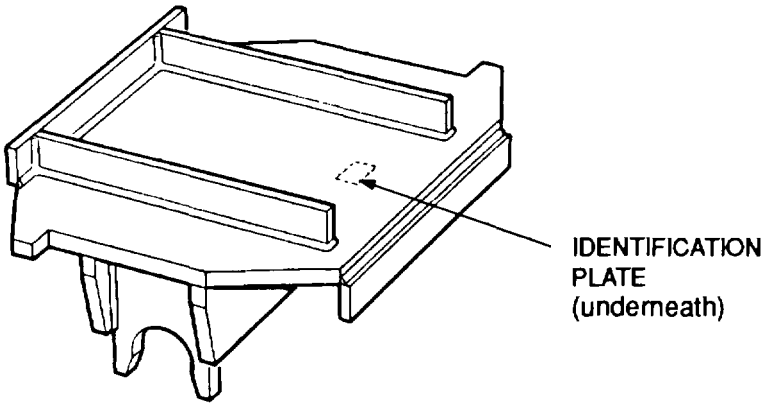
(3) HEAD. Used to position jack in jack hood of roller beam, in lifting bracket of jackpost, and in saddle of landing roller pedestal.

(4) BASE. Used for supporting jack in jack support, and in jackseat of landing roller pedestal.

(5) RELEASE VALVE. Used to lower jack ram. Use the hexagon head on the end of the jack handle to operate the release valve.

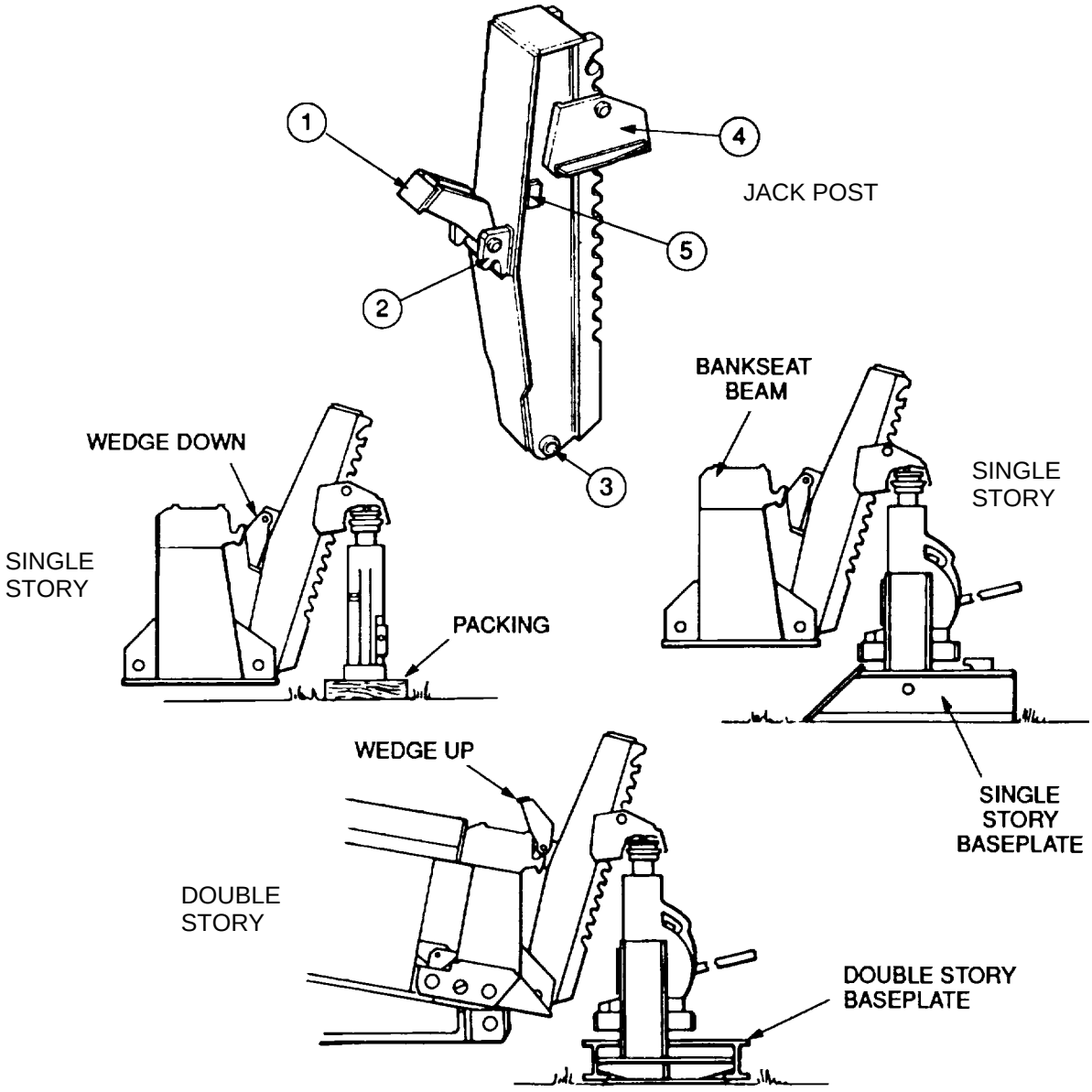
(9) Jack Seat

The jack seat is used to support the jack in the adjustable support. The jack seat is placed on support pins or capsill pin to change the height of the jack. The open end of U-shaped ridge on top of the jack seat faces toward the outside of the adjustable support.



(10) Jack Post

The jack post is connected to the jack post brackets on the bankseat beam to provide an adjustable bracket for jacking the bridge up or down.



WARNING

DO NOT place jack hood (4) (bracket assembly, lifting) In top notch and try to raise bridge with jack. Serious injury to personnel and damage to bridge may occur.

(1) WEDGE. Used between jack post and bankseat beam as a spacer to provide more clearance for the jack in single story construction.

(2) HOOK. Connects post to ramp shelf on bankseat beam in double story construction.

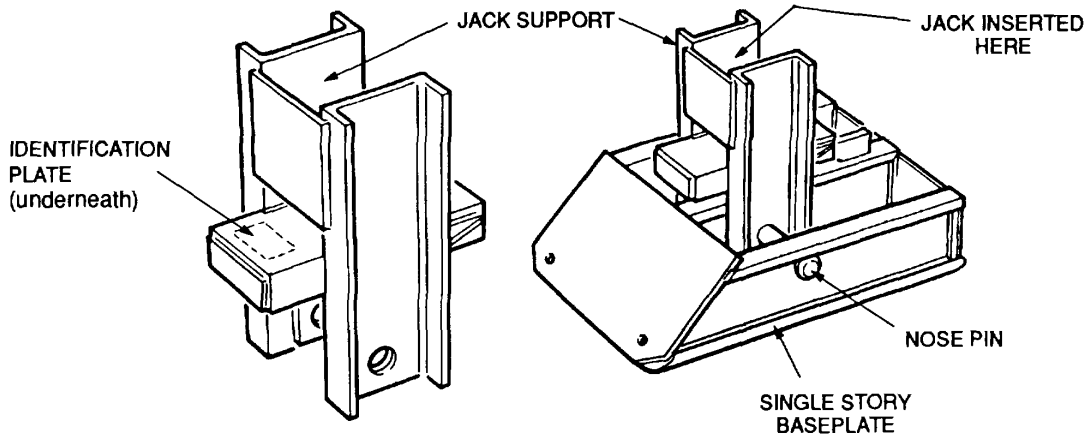
(3) NOSE PIN HOLE. For insertion of a nose pin to secure bottom of post to jack post bracket on bankseat beam.

(4) JACK HOOD (BRACKET ASSEMBLY, LIFTING). Movable hood for positioning of hydraulic jack.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(11) Jack Support

The jack support is used to support the jack on single or double story baseplates during jacking of the bridge.



(12) Light Launching Nose, Front and Rear Sections

These sections are used as a complete launching nose for 4 thru 8 bay single story and as the first two nose sections of launching noses on 9 thru 12 bay single story, and 1 thru 22 bay double story and link reinforced bridges.

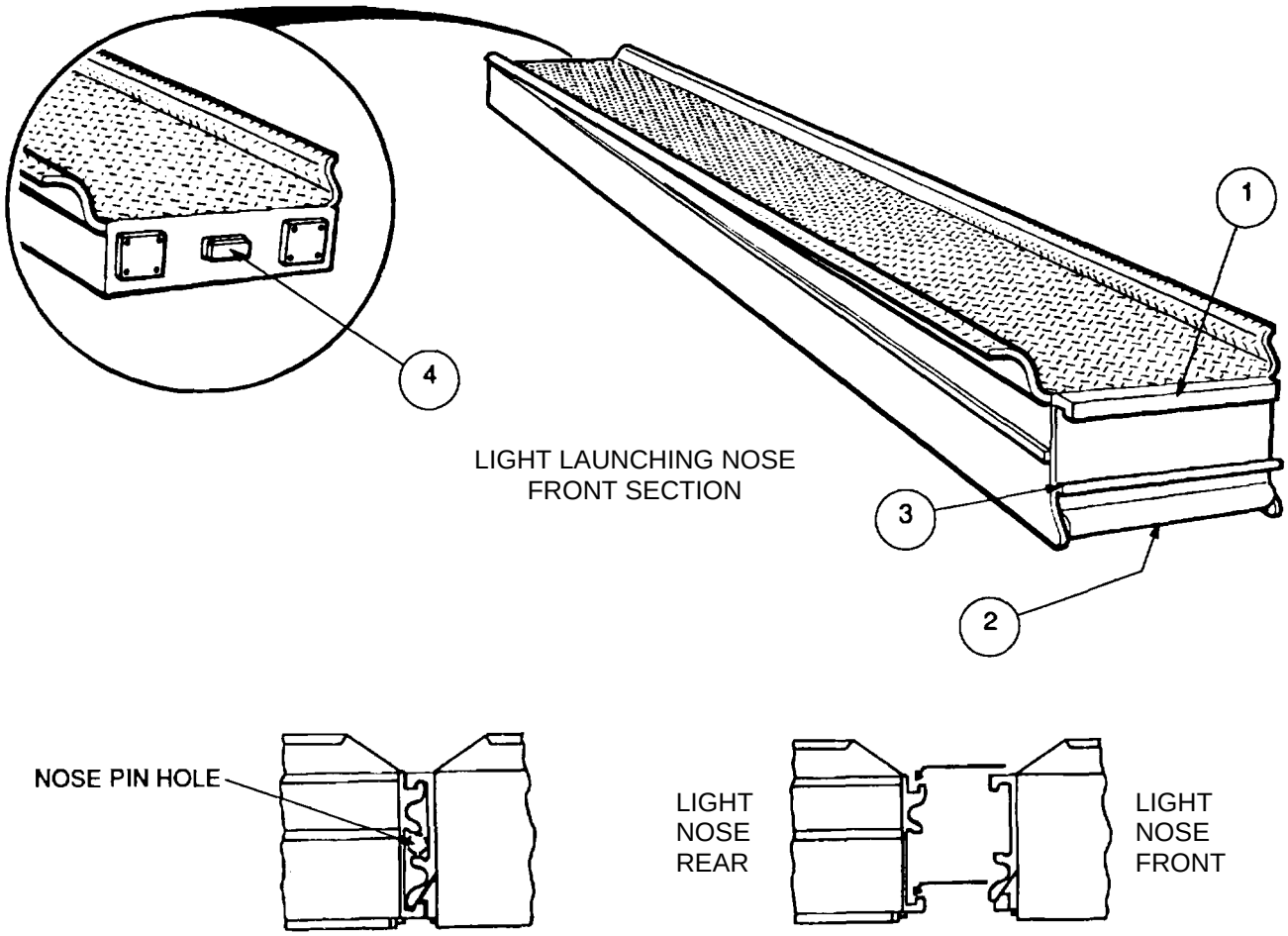
(a) Front Section

(1) TOP RAIL. Hooks over top rail of rear nose section.

(2) BOTTOM RAIL. Hooks over bottom rail of rear nose section.

(3) CENTER LUG. With center lug of rear section, forms nose pin slot.

(4) IDENTIFICATION PLATE. The component serial number is marked on this plate.



(b) Rear Section

(1) TOP RAIL. Mates with top rail of front nose section.

(2) BOTTOM RAIL. Mates with bottom rail of front nose section.

(3) CENTER LUG. With center lug of front section, forms nose pin slot.

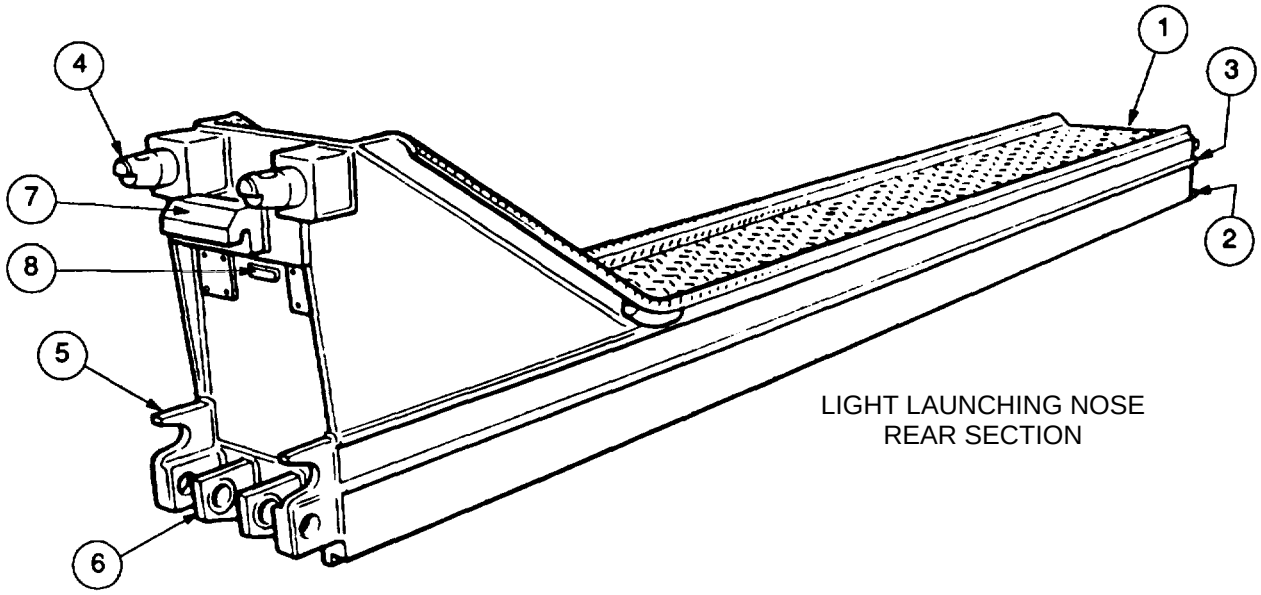
(4) DOWELS. Used to line up nose section with heavy launching nose section.

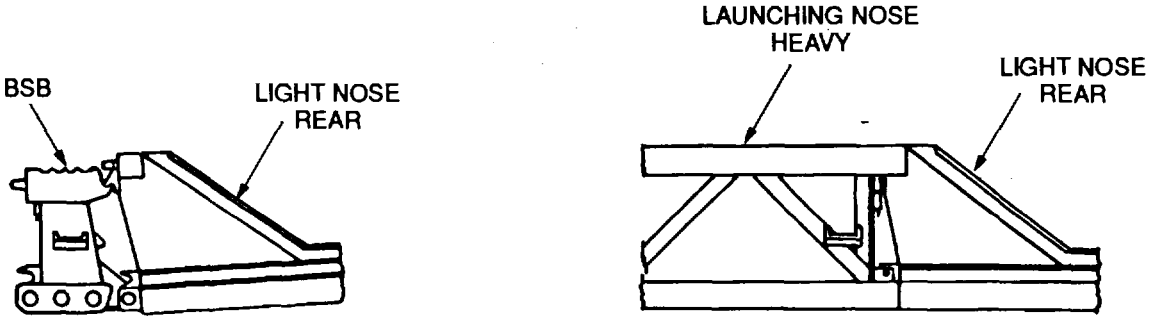
(5) GUIDE SLOTS. Used to line up pin jaws so nose pin can be inserted by hand.

(6) PIN JAWS. Takes tension load when connected by nose pin to bankseat beam or another nose section.

(7) CENTER HOOK. Connects to ramp shelf on bankseat beam in 4 thru 8 bay single story construction.

(8) IDENTIFICATION PLATE. The component serial number is marked on this plate.





(13) Launching Nose Heavy (LNH)

The launching nose heavy forms the main part of the launching nose needed for 9 thru 12 bay single story, and all double story and link reinforced bridges.

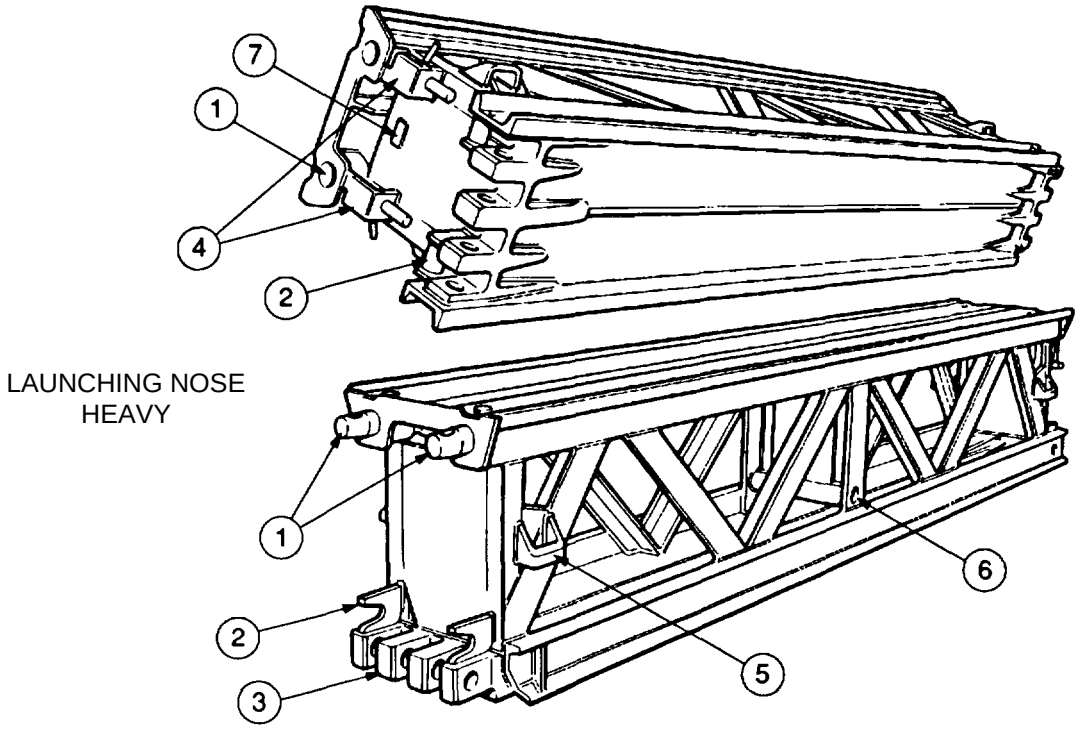
(1) DOWELS AND SOCKETS. Used to line up nose sections for connection to each other.

(2) RESILIENT MOUNTS AND GUIDE SLOTS. Used to line up pin laws so nose pin can be inserted by hand.

(3) PIN JAWS. Takes tension load when connected by nose pin to another nose section.

(4) SHOOT BOLTS. Locks and holds top of nose section to another section during construction.

(5) CARRYING BAR BRACKETS. For connection of carrying bars used to carry panel. Two brackets on each side.



(6) ANCHORAGE TUBE. For insertion of panel pin used to secure launching nose to nose roller and the launching nose link on a double story launching nose.

(7) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(14) Launching Nose Roller (LNR)

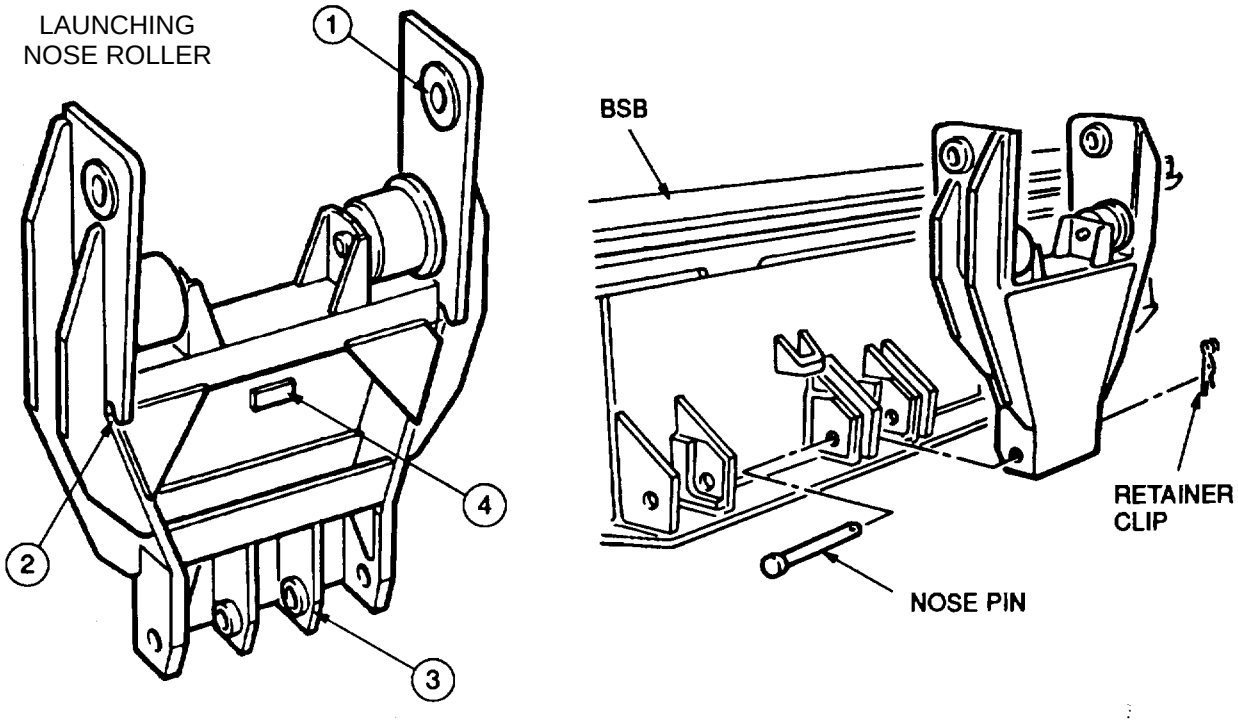
The launching nose roller is connected to the bankseat beam and permits movement of the launching nose during construction. It also provides support and an anchorage point for the launching nose, during and at completion of construction.

(1) ANCHORAGE HOLES. For insertion of panel pin to secure nose to roller.

(2) RAMP SHELF HOOKS. For connection of roller to ramp shelf of bankseat beam.

(3) PIN JAWS. Connects bottom of nose roller to center bracket of bankseat beam with launching nose pin.

(4) IDENTIFICATION PLATE. The component serial number is marked on this plate.



(15) Launching Nose Cross Girder Post

The launching nose cross girder post is used to connect the cross girder to the bridge, and to permit positioning of the cross girder in any one of eight positions.

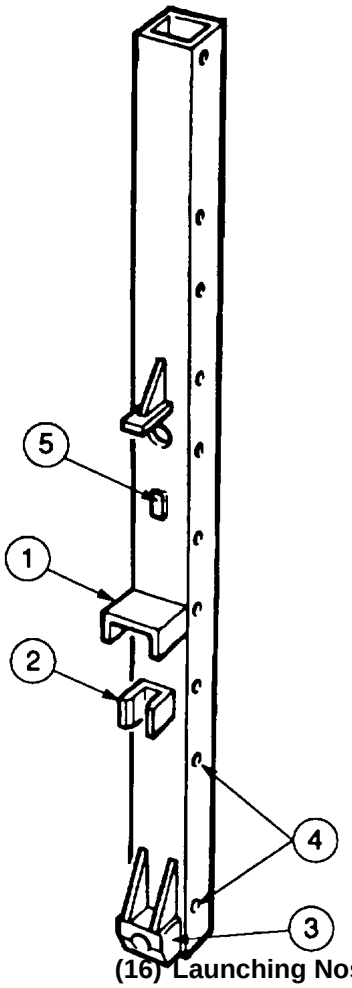
(1) TOP LUG. Connects to lug on junction panel.

(2) CENTER LUG. Connects to compression faces of two top panels in single story construction.

(3) BOTTOM LUG. For connection of post to bottom of top panels or junction panel. Headless panel pin is always used to connect bottom of post to panel.

(4) PIN HOLES. For insertion of captive pins to secure cross girder to posts.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.



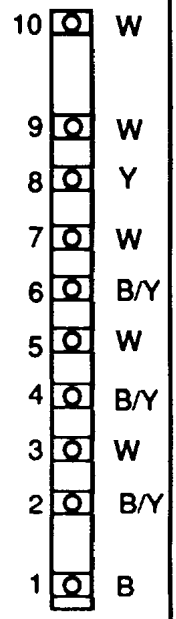
WHITE STRIPE (FOR MULTI-SPAN BRIDGES)
HOLES NUMBERED 3, 5, 7, 9 AND 10
(FROM BOTTOM UP)

NOT USED ON U.S. MGB

YELLOW STRIPE (FOR DS BRIDGES)
HOLES NUMBERED 2, 4, 6, AND 8
(FROM BOTTOM UP)
HIGH POSITION 6 - BETWEEN HOLES 6 AND 8
MID POSITION 4 - BETWEEN HOLES 4 AND 6
LOW POSITION 2 - BETWEEN HOLES 2 AND 6

BLACK STRIPE (FOR SS BRIDGES)
HOLES NUMBERED 1, 2, 4 AND 6
(FROM BOTTOM UP)
HIGH POSITION 4 - BETWEEN HOLES 4 AND 6
MID POSITION 2 - BETWEEN HOLES 2 AND 4
LOW POSITION 1 - BETWEEN HOLES 1 AND 2

LAUNCHING NOSE CROSS GIRDER POST



(16) Launching Nose Cross Girder (LNCG)

The launching nose cross girder is used to hold the near bank end of the launching nose in the position set for construction and launch.

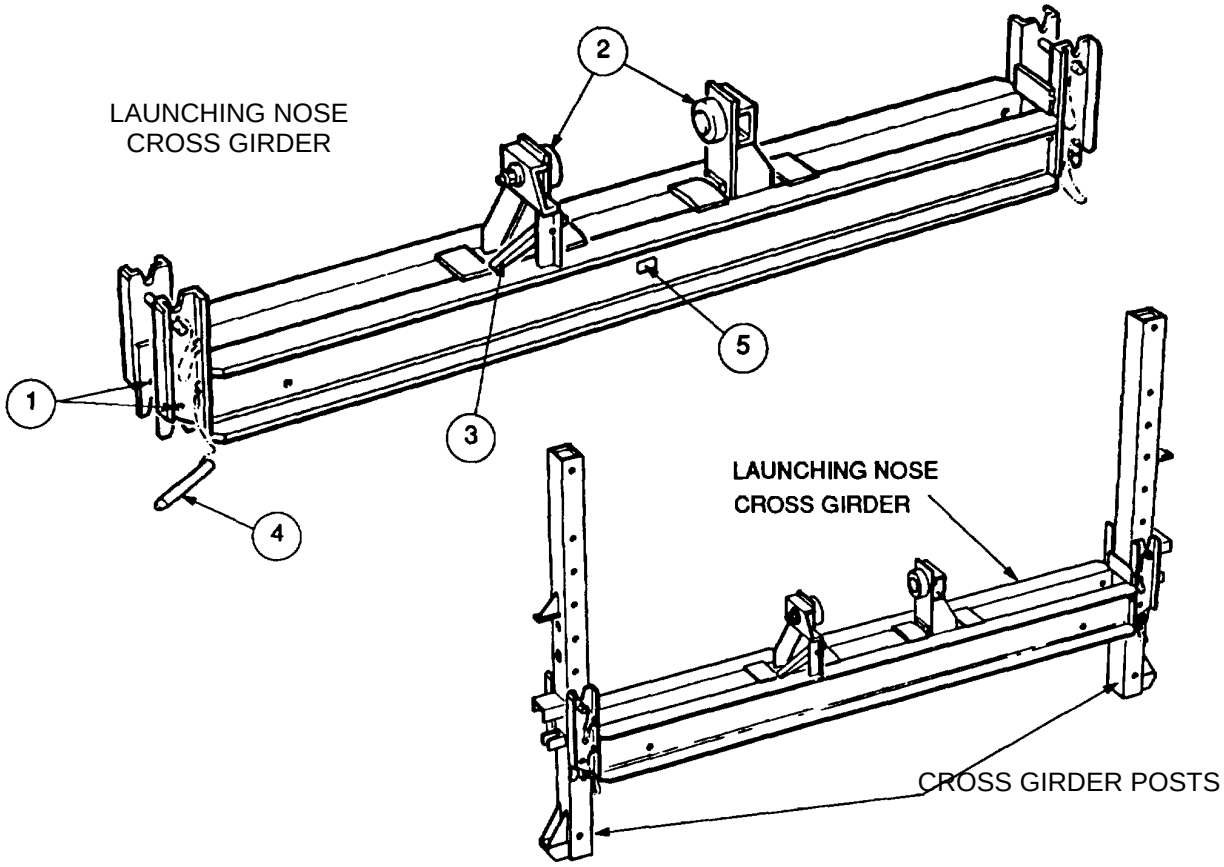
(1) PIN HOLES AND-JAWS. For insertion of captive pins to secure girder to posts.

(2) ROLLERS. Bottom rail of heavy launching nose sections will run under rollers.

(3) GRAVITY CATCH. Used to prevent over-launching of nose during construction.

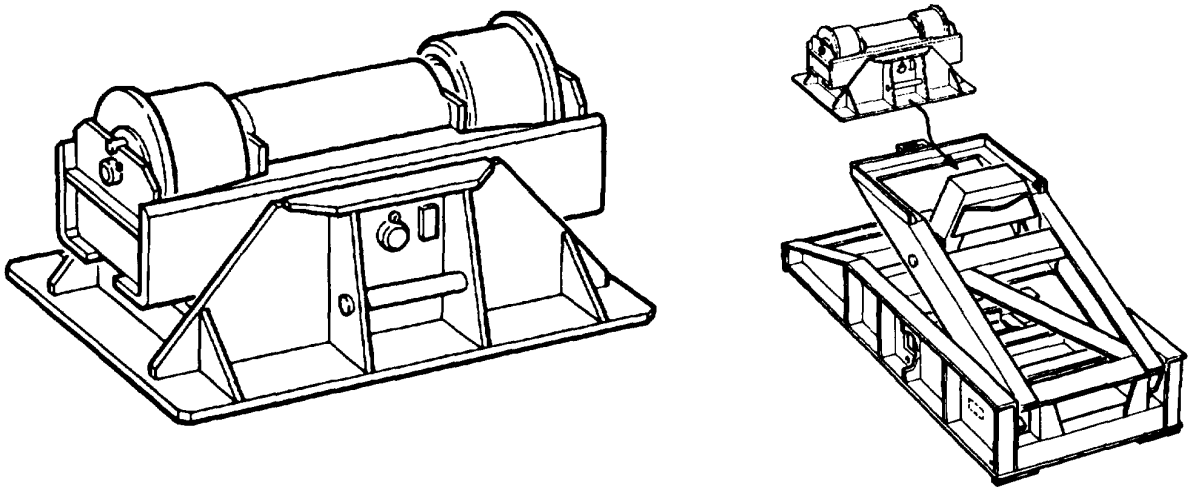
(4) CAPTIVE PINS. Used to secure girder to posts. Retainer clips must be used in captive pins.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.



(17) Landing Roller (LR)

The landing roller is used on the far bank to receive the launching nose. It can be used on the ground for 4 thru 8 bay single story, or on the landing roller pedestal for 9 thru 12 bay single story and 1 thru 22 bay double.

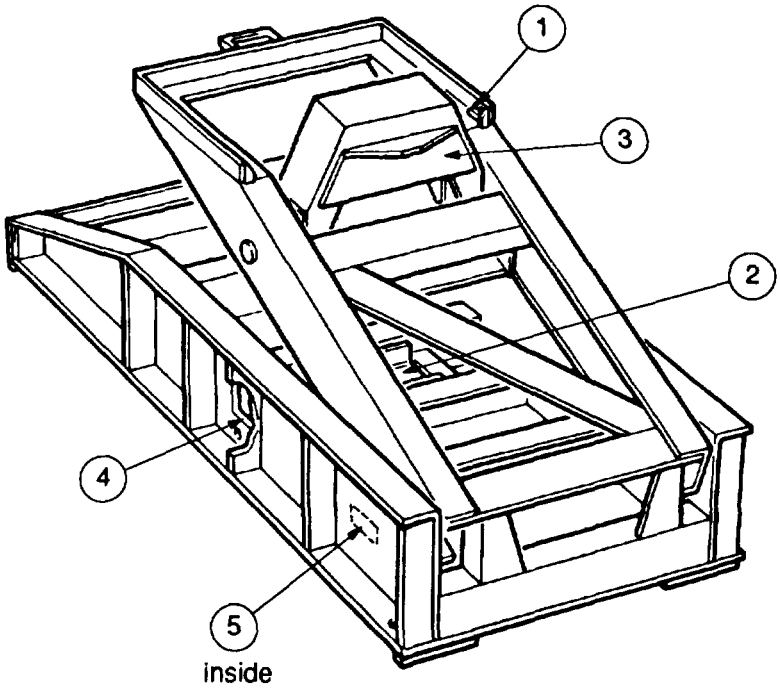


(18) Landing Roller Pedestal MK1 (LRP)

The landing roller pedestal holds the landing roller and receives the launching nose on the far side of the gap. It is used in 9 thru 12 bay SSB's and 1 thru 22 bay DSB's. The height of the roller pedestal is adjusted with a hydraulic jack 15T.

WARNING

Use extreme care when the pedestal Is being raised or lowered. DO NOT use any other opening In pedestal as a point to operate jack. DO NOT Insert hand In access hole. Use the jack handle only to operate the lack. Failure to follow these Instructions will result In serious bodily Injury.



LANDING ROLLER
PEDESTAL Mk 1

(1) LUGS. Hold rear of landing roller in position.

(2) JACK SEAT Base for 15T hydraulic jack used to adjust height of upper frame. Pivot mounted to keep jack seated in frame during operation.

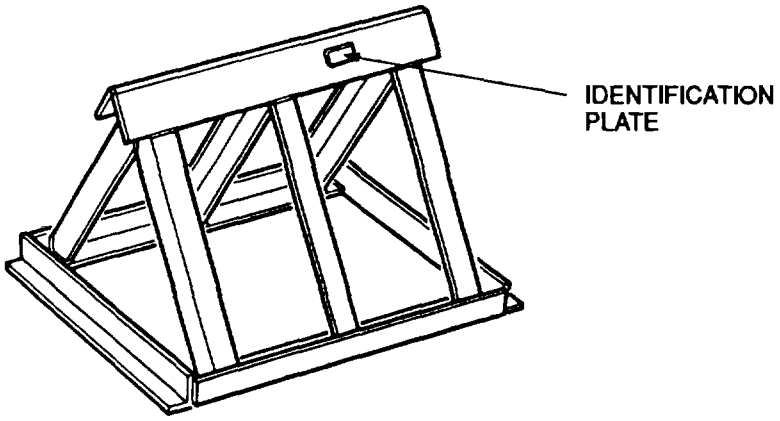
(3) SADDLE. Fits head of jack. Pivot mounted to keep saddle on jack head during operation.

(4) ACCESS HOLES. For safe operation of hydraulic lack.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

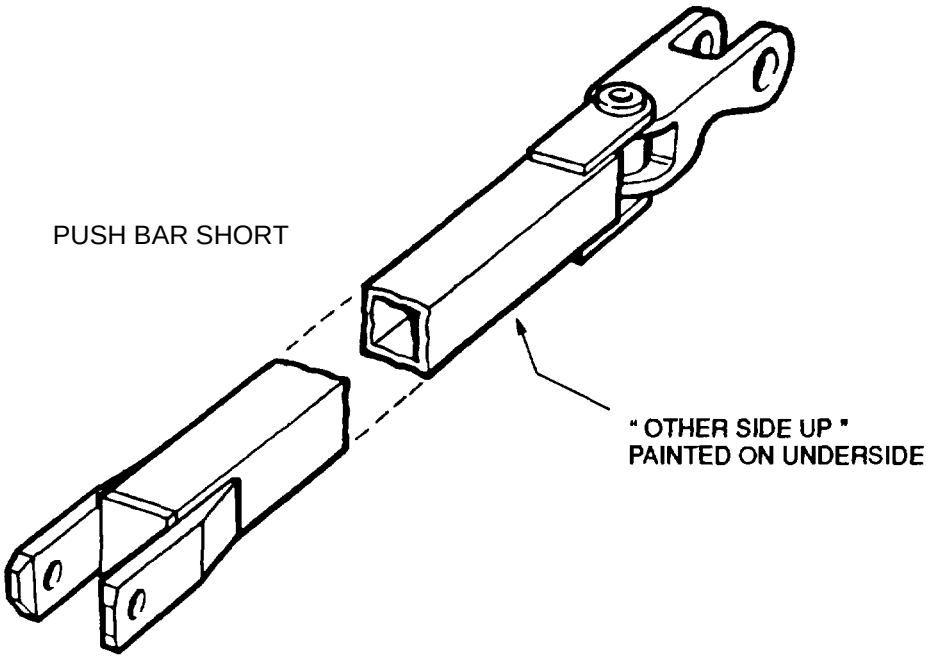
(19) Building Pedestal (BP)

The building pedestal is used under the girders to keep the bridge off the ground during construction of all single story bridges.



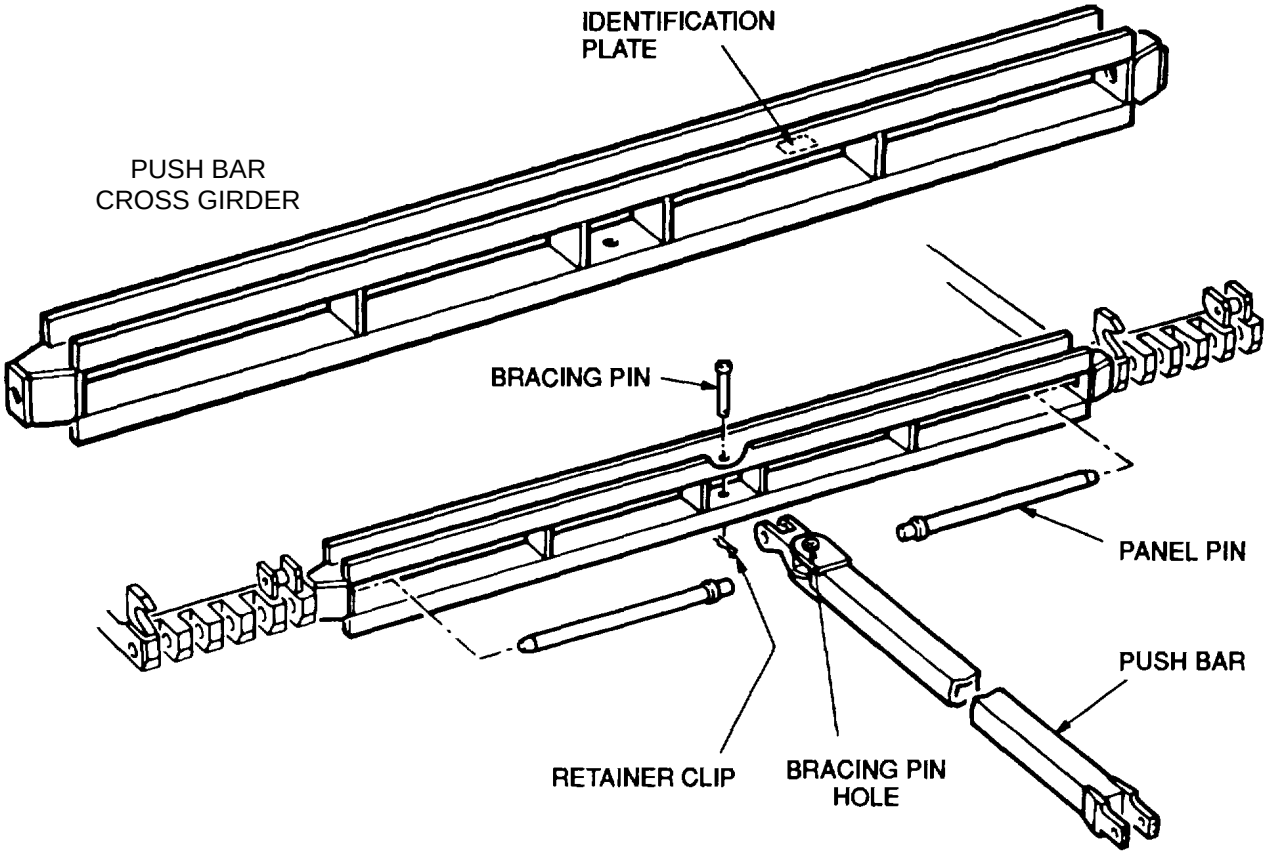
(20) Push Bar Short

The push bar short is used to boom and launch bridges over 8 bay single story. It is also used to boom and launch double story bridges over 8 bays long, and to connect the truck to the davit post.



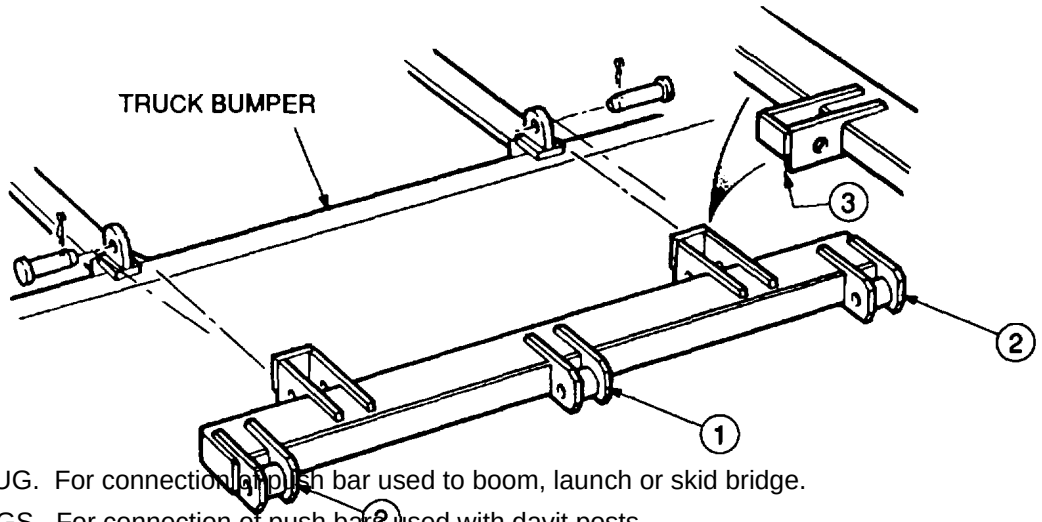
(21) Push Bar Cross Girder (PBCG)

The push bar cross girder is used to connect the push bar to the bridge, to enable the bridge to be boomed during construction.



(22) Push Bar Adapter

The push bar adapter is used to connect the push bar to the bumper of the truck.



(1) CENTER LUG. For connection of push bar used to boom, launch or skid bridge.

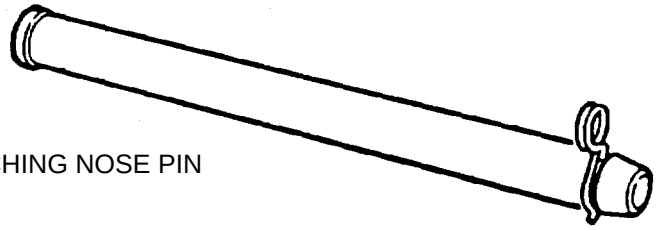
(2) OUTER LUGS. For connection of push bar used with davit posts.

(3) NOTCH. Adapter must always be fitted with notch facing down.

(23) Launching Nose Pin

The launching nose pin is used as follows:

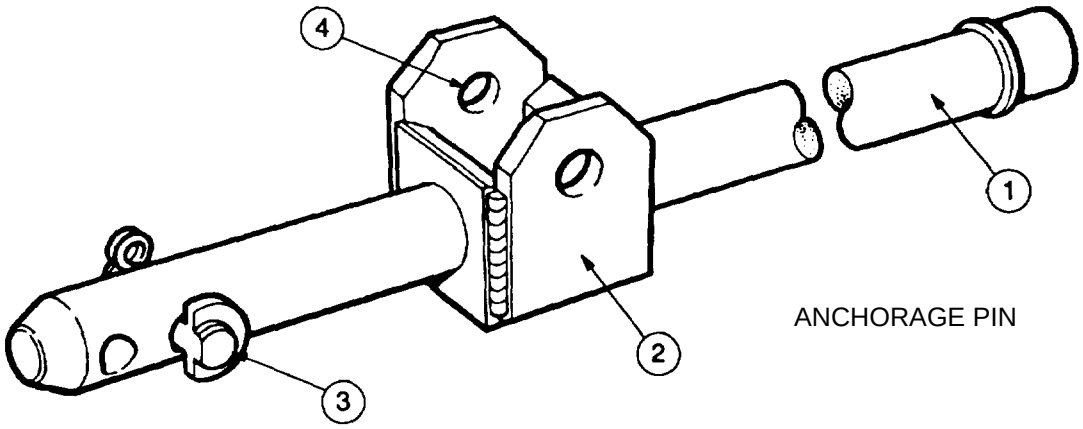
(a) To connect nose sections together.
(b) To connect light rear nose section, nose roller, push bar and jack posts to bankseat beam.
(c) To connect jack support to baseplates.
(d) To connect links to each other and to post tensioning and anchor assemblies.
(e) Used in post tensioning assembly to secure post in the transit or tensioned positions.



LAUNCHING NOSE PIN

(24) Anchorage Pin

The anchorage pin is used as an anchor point on the bridge for anchorage cables. The anchorage pin is used instead of a panel pin at the junction of the first and second, last and next to last bays in a single story bridge. In double story and link reinforced bridges, the anchorage pin is placed in the anchorage holes in the end taper panel.



ANCHORAGE PIN

(1) PIN.

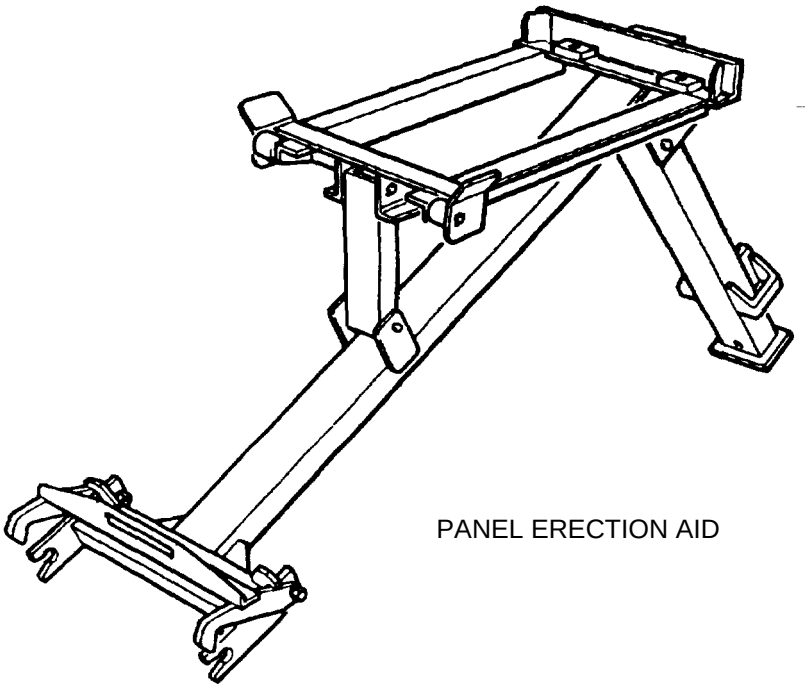
(2) LUG. Used as a housing for a bracing pin which holds the anchorage cable.

(3) RETAINING PIN. Retains the lug and is secured with a retainer clip.

(4) LUG PIN HOLE. For a bracing pin which is used to hold the anchorage cable.

(25) Panel Erection Aid

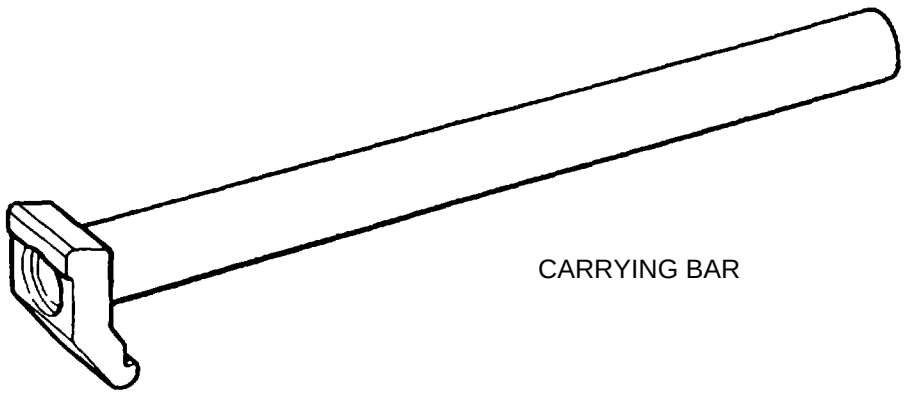
The panel erection aid is used to lift top panels into place in double story bridges if rear end of bridge is too high for personnel to lift top panels.



PANEL ERECTION AID

(26) Carrying Bar

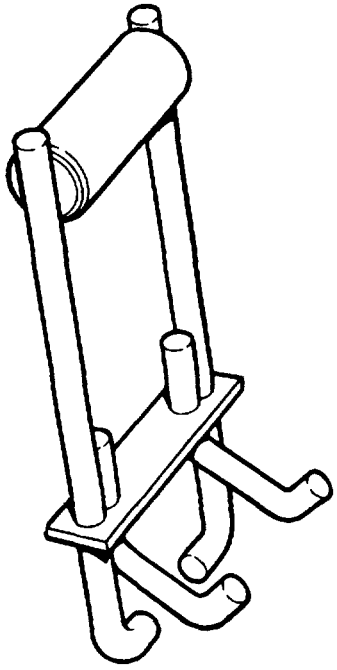
The carrying bar is used to lift and carry all panels, bankseat beam, heavy nose sections, long ramps, and end taper panels. It is also used to lift the panel erection aid.



CARRYING BAR

(27) Carrying Handle

The carrying handle is used to carry deck and ramps.



CARRYING HANDLE

c. Link Reinforcement Components. Each LRS component is illustrated and its function explained. Only the components unique to the LRS are described.

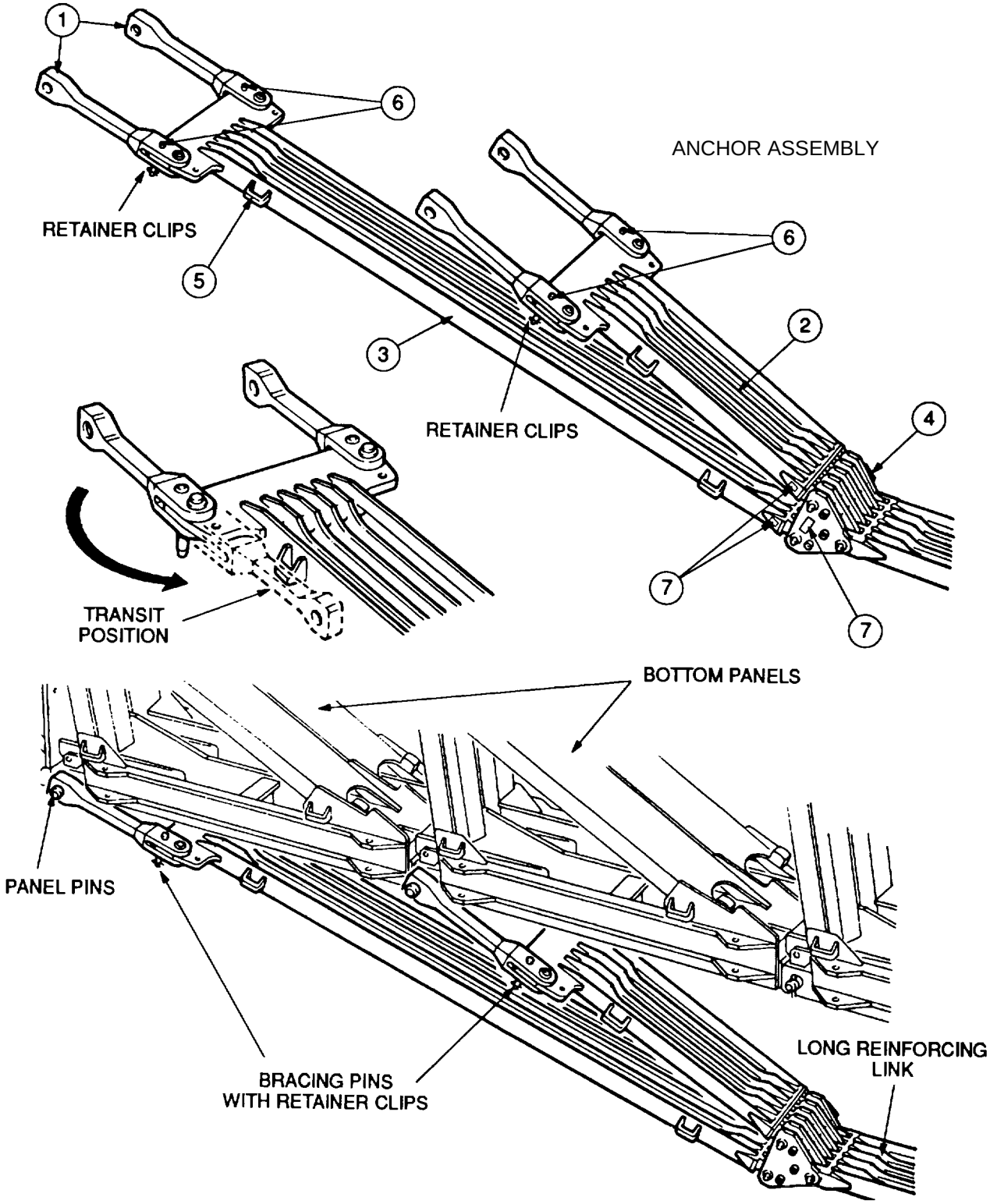
(1) Anchor Assembly (AA)

The anchor assembly anchors the chain of links to two of the bottom panel pins at each end of the bridge. Each anchor assembly is brought to the site assembled with the fork end anchors folded in the transit position, and is carried by four personnel. Do not switch the parts of one anchor assembly with the parts of another.

WARNING

Use extreme care when handling the anchor assembly. It is a multihinged component, and serious bodily injury may occur from improper handling.

To connect the assembly to the bridge, the fork end anchors are swung over the projecting ends of the bottom panel pins and then secured by bracing pins and retainer clips.



(1) FORK END ANCHORS. Connect to the projecting ends of the panel pins in the bottom panels at the ends of the bridge. There are two fork end anchors on each of the two anchor links. The anchors can be secured in either the transit or operational position with bracing pins and retainer clips provided.

(2) LINK ANCHOR SHORT. Takes the tension load from the anchor junction blocks and transfers it to the fork end anchors and the bottom panel pins.

(3) LINK ANCHOR LONG. Takes the tension load from the anchor junction block and transfers it to the fork end anchors and the bottom panel pins.

(4) ANCHOR JUNCTION BLOCK. Connects the link anchors to the long reinforcing link attached to the post tensioning assembly. The block has a guide system built into it which allows the nose pin to be inserted easily when connecting the reinforcing link.

(5) CARRYING BAR BRACKETS. The anchor assembly has six brackets, four on the link anchor long and two on the link anchor short. The two brackets on the link anchor short are used only to position the link for connection to the pins in the bottom panel.

(6) BRACING PINS AND HOLES. For positioning of the fork end anchors in either the transit or operational position. The bracing pins are always inserted from the top of the fork.

CAUTION

Ensure four bracing pins stay with this component. Do not use these bracing pins in any other component.

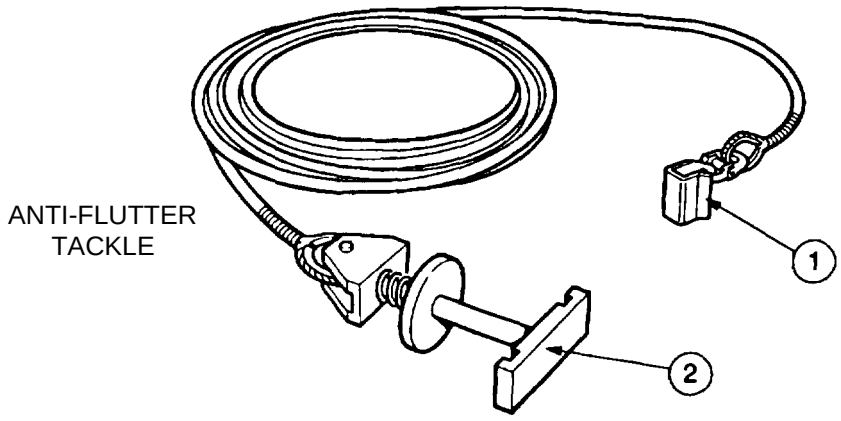
(7) IDENTIFICATION PLATE. The component serial number is marked on this plate.

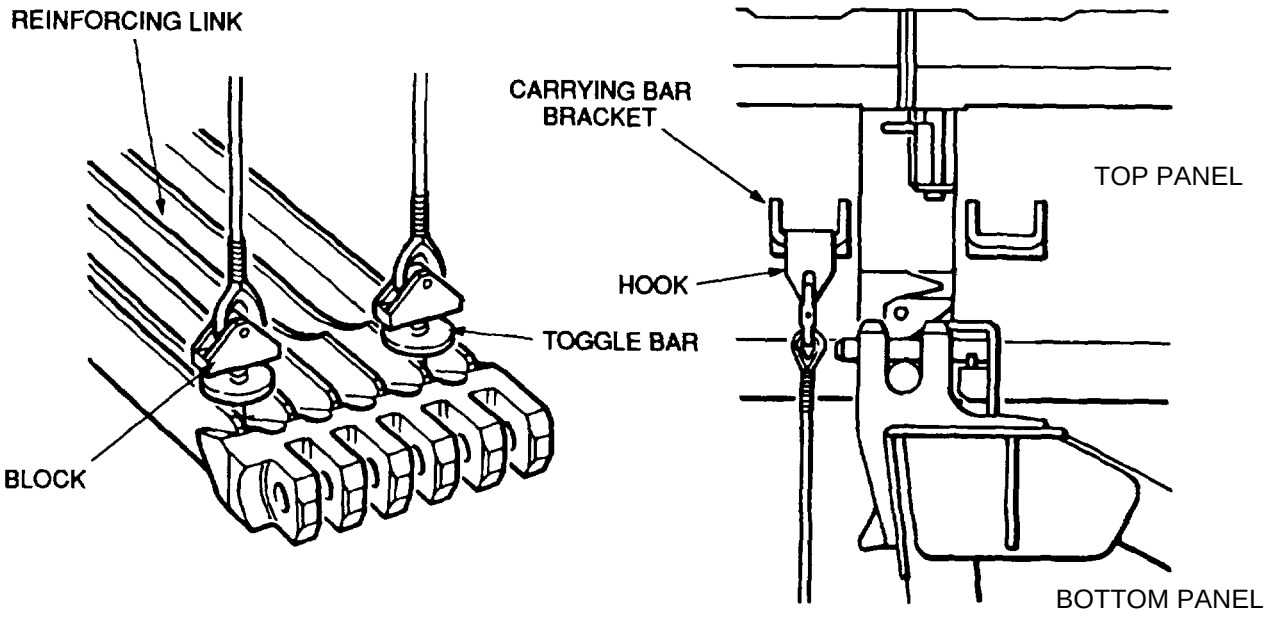
(2) Anti-flutter Tackle

The anti-fluttertackle is used between top panels and reinforcing links to reduce vibrational flutter which may be caused by side winds or crossing vehicles. For all link reinforced bridges, two sets of anti-fluttertackle should be fitted under each girder approximately mid span. Connection is made by inserting the toggle bar into the elongated slot of the link. The block is pushed against the spring and rotated 900 which locks it into position. The hook end is then placed over the carrying bar bracket of the top panel.

(1) HOOK. Connects to the carrying bar bracket of a top panel.

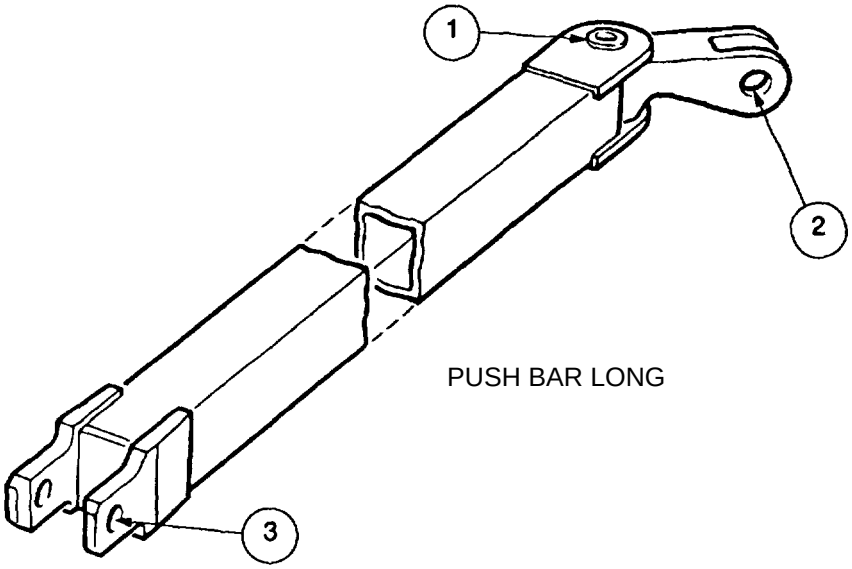
(2) TOGGLE BAR. Connects the lower end of the tackle to the link. It is spring loaded to keep it in the locked position.





(3) Push Bar Long

The push bar long is used to boom and launch all reinforced bridges over 12 bays long, and between davit posts, and push bar adapter on truck.



PUSH BAR LONG

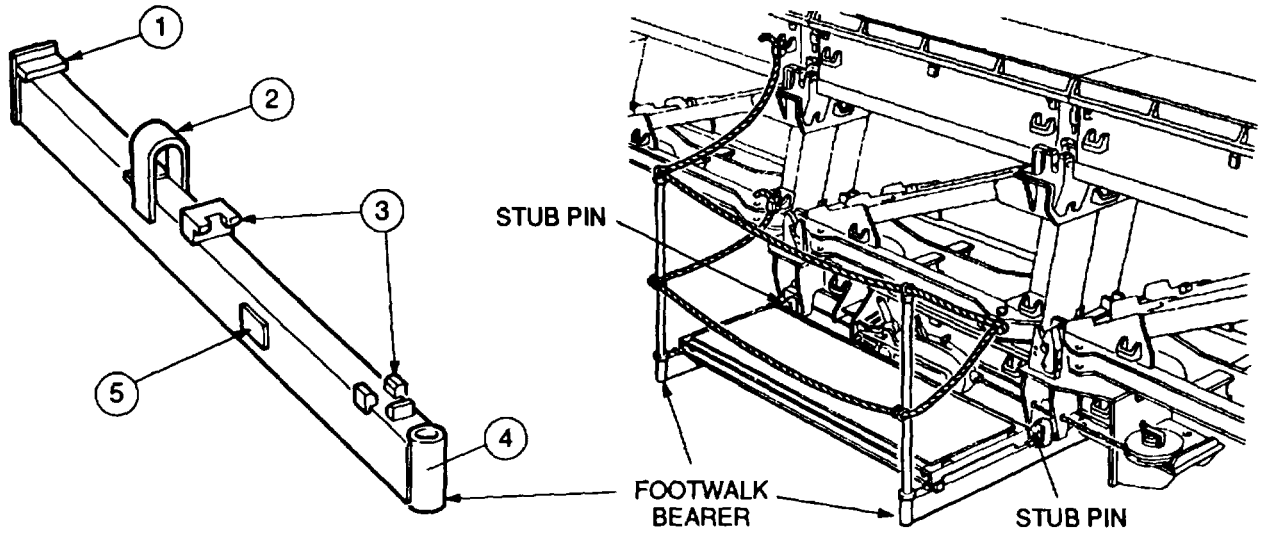
(1) BRACING PIN HOLE. For bracing pin when connecting to push bar and cross girder.

(2) NOSE PIN HOLE. For nose pin when connecting to bankseat beam. Use a bracing pin when connecting push bar to bracket on davit post.

(3) BRACING PIN HOLE. For bracing pin when connecting to push bar adapter on truck.

(4) Footwalk Bearer.

The footwalk bearer is used to support the footwalk section on the post tensioning assembly.



(1) BEARING PAD. Rests against the bottom of the post tensioning assembly.

(2) STUB PIN BRACKET. Locates over the stub pin.

(3) FOOTWALK STOPS. For positioning the footwalk section.

(4) FOOTWALK POST HOLE. For footwalk post.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(5) Jacking Bracket

The jacking bracket connects to the bankseat beam to provide a lifting point and a support base for the cable pullers. The cable pullers are operated from the bankseat beam to lift or lower the end of the bridge.

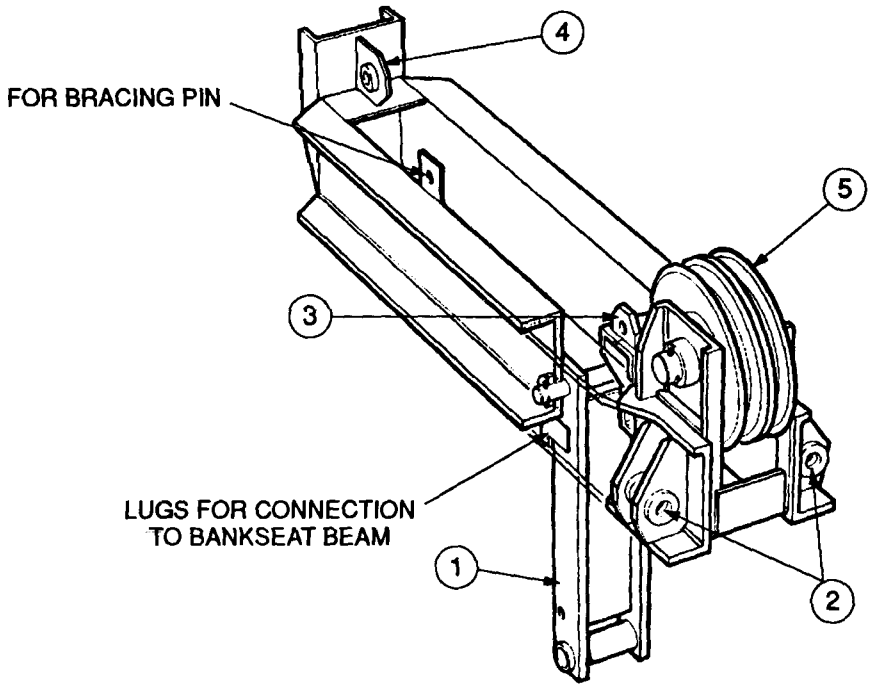
(1) LINK. Pins to bankseat beam with a nose pin. Secure with a retainer clip.

(2) SAFETY CHAIN LUGS. For connection of safety chains on davits to jacking bracket. Use a bracing pin and retainer clip to secure chains to brackets.

(3) CABLE LUG. For connection of cable from puller to jacking bracket. Use a bracing pin and retainer clip.

(4) PULLER LUG. For pinning of puller to bracket. Use the anchor pin in the cable puller to secure puller to jacking bracket. DO NOT USE any other type of pin.

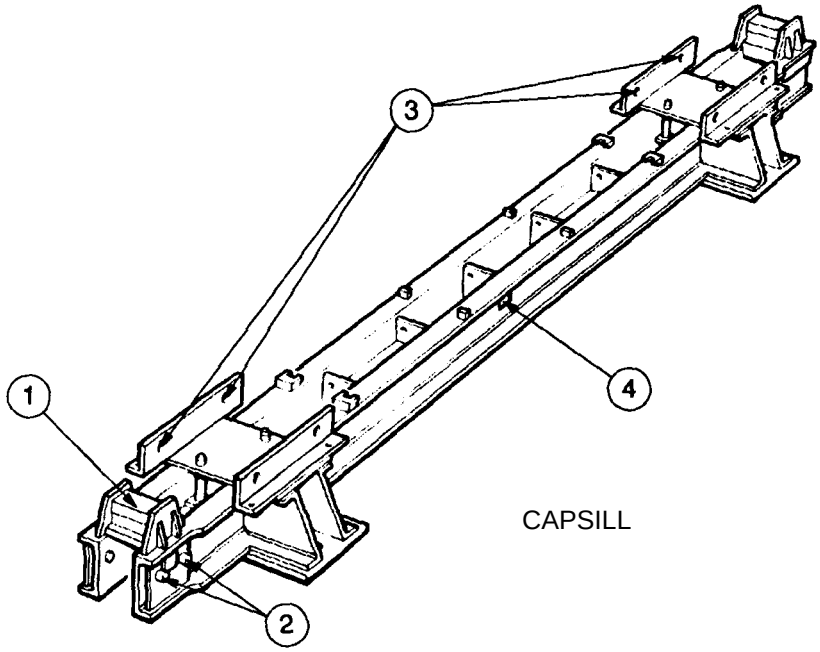
(5) PULLEYS. For reeving of puller cables.



JACKING BRACKET

(6) Capsill

The capsill is used in the MOB adjustable support and, together with the rocking rollers, forms the heavy duty capsill roller beam (CRB). The CRB is used when constructing 2E + 13 thru 2E + 22 bay double story bridge with or without link reinforcement. The rocking rollers used in the capsill are separate items, and are pinned into the capsill with nose pins and retainer clips. The capsill is carried by six personnel. When rocking rollers are installed, eight personnel are required.



CAPSILL

(1) JACK HOOD. For positioning the jack used to raise or lower the CRB. These hoods are fixed, and do not move like the hoods in the roller beam.

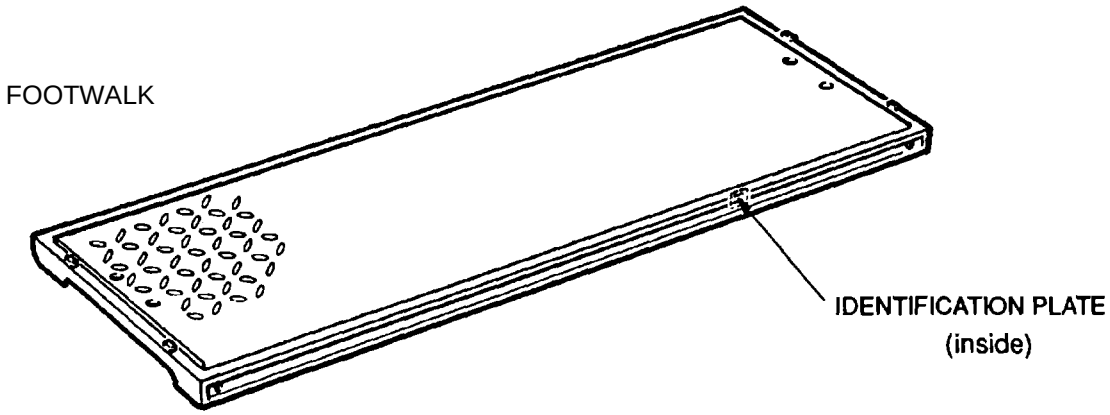
(2) FIXED PINS. These pins hold the capsill into the adjustable support posts.

(3) NOSE PIN HOLES. Nose pins are inserted into these holes to secure rocking roller to capsill.

(4) IDENTIFICATION PLATE. The component serial number is marked on this plate.

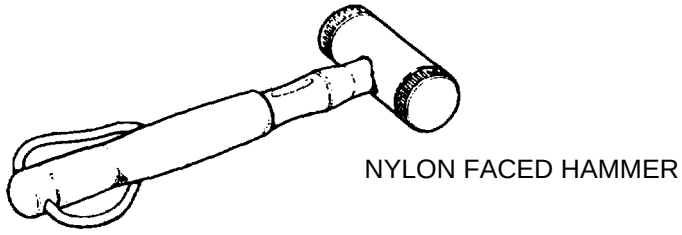
(7) Footwalk

The footwalk is used as a platform for the post tensioning work party to stand on, when operating the cable pullers.



(8) Nylon Faced Hammer

The nylon faced hammer is used on the bracing pins in the fork end anchors, and can be used on other small pins.



(9) Davit Post Assembly

The davit post assembly is used to raise or lower the bridge. Two davits are used at the end of the bridge which allows the bridge to be raised or lowered a maximum or 4.3 ft (1.3 m). The davit is carried by four personnel.

(1) PUSH BAR LUGS. For connection of the short or long push bars from launch vehicle. This vehicle will be used to keep the davit pulleys vertical above the jacking bracket pulleys.

(2) LEVELLING SCREWS. These screws are used to level the davit over the baseplates. Packing can be used under baseplates it screws do not level davits as much as needed.

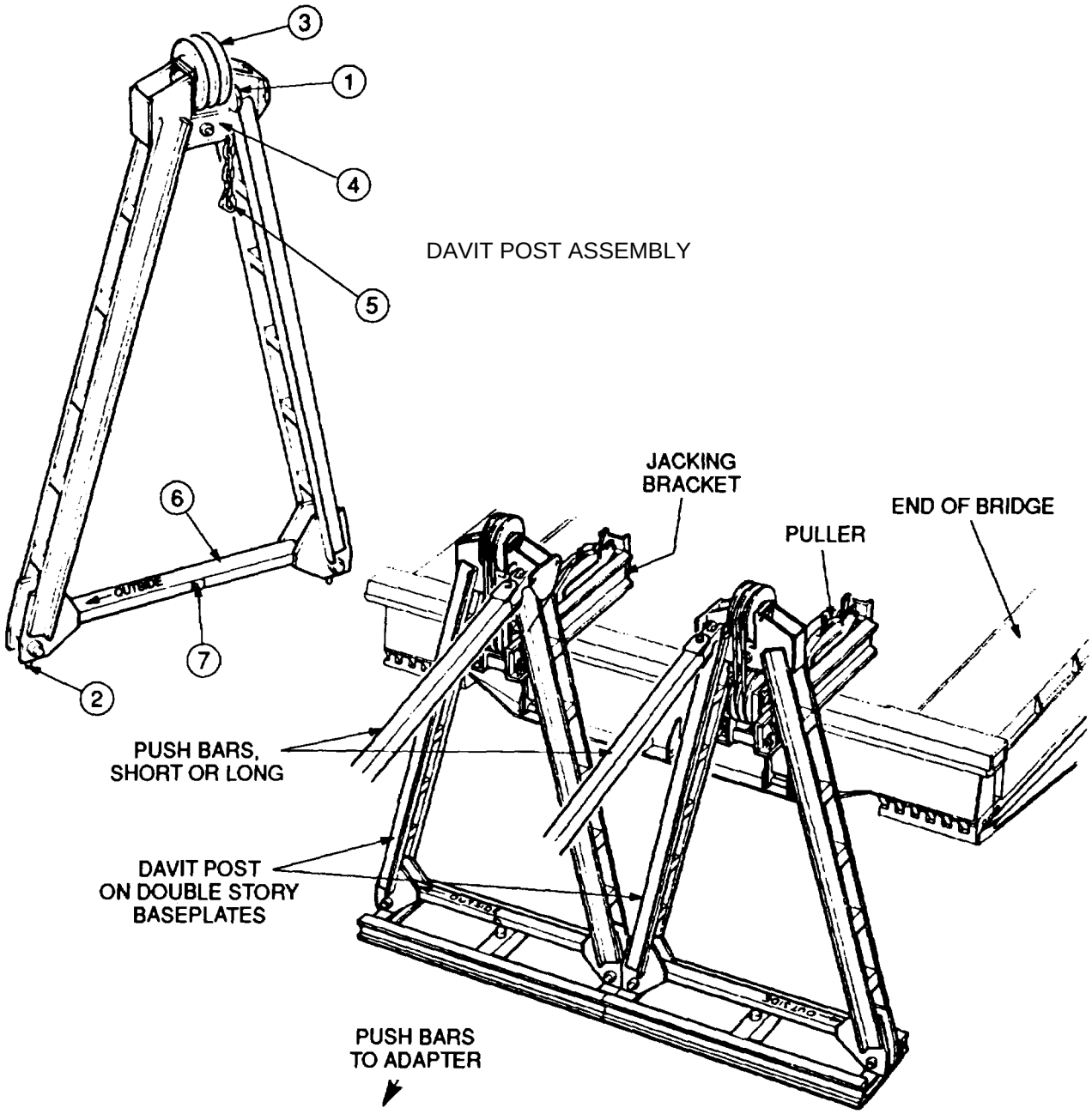
(3) PULLEYS. For reeving of puller cable.

(4) GUSSET PLATE. The connecting plate between the two legs of the davit. During the raising or lowering operation, the cable rust be kept free of this plate.

(5) SAFETY CHAINS. These chains are connected to jacking bracket before raising or lowering the bridge.

(6) MARKING. The bottom cross member is marked as shown to ensure that the davits are assembled in the correct orientation. The arrow must point towards the outside of the bridge.

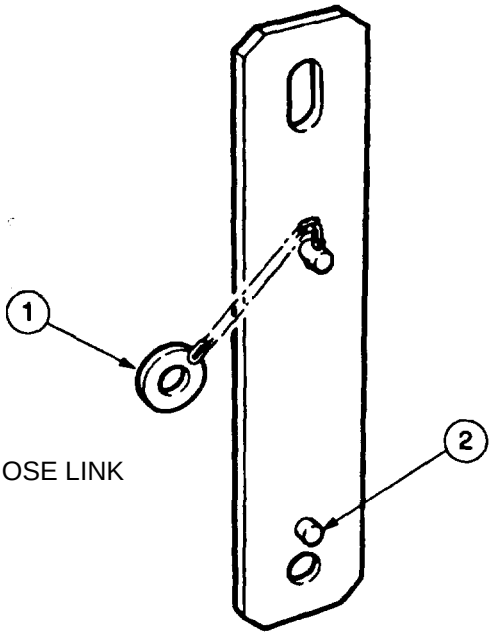
(7) IDENTIFICATION PLATE. The component serial number is marked on this plate.



DAVIT POST ASSEMBLY

(10) Launching Nose Link (LNL)

The launching nose link connects the second story launching nose to the first story and to the launching nose roller. It is used on the longest double story and link reinforced bridges.



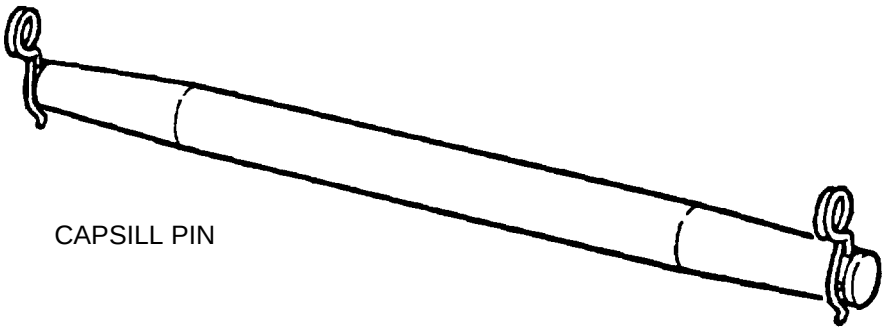
LAUNCHING NOSE LINK

(1) WASHER. Used on headless pin with retainer clip.

(2) SPACER. Provides correct spacing from nose section.

(11) Capsill Pin

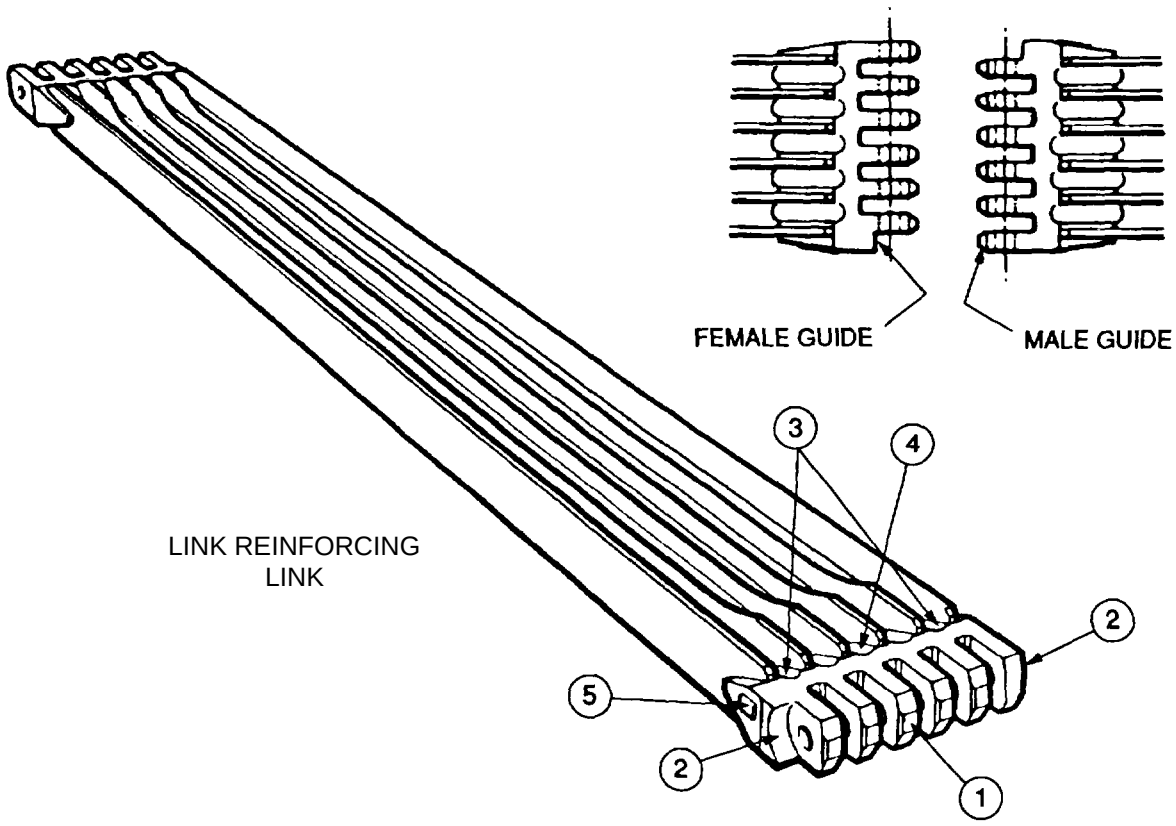
The capsill pin is used to support the jack seat in certain positions in the adjustable support. The capsill pin is required for use when constructing 2E + 13 thru 2E + 22 bay bridges with and without link reinforcement.



CAPSILL PIN

(12) Long Reinforcing Link

The long reinforcing link is used to reinforce double story bridges and connects to other reinforcement components with nose pins. The pin jaws of each link have a guide system built into them and these guides allow easy insertion of the nose pin. A long link connects the anchor junction block to the post tensioning assembly. The long link is carried by two personnel.



(1) PIN JAWS. Take tension load when connected by nose pin to another link in the link chain. Nose pin is inserted from the outside toward the inside and secured with a retainer clip.

(2) MALE AND FEMALE GUIDE. Allows easy insertion of nose pin used to connect links.

(3) OUTER SLOTS. For insertion of the toggle bar that connects the anti-flutter tackle to the link.

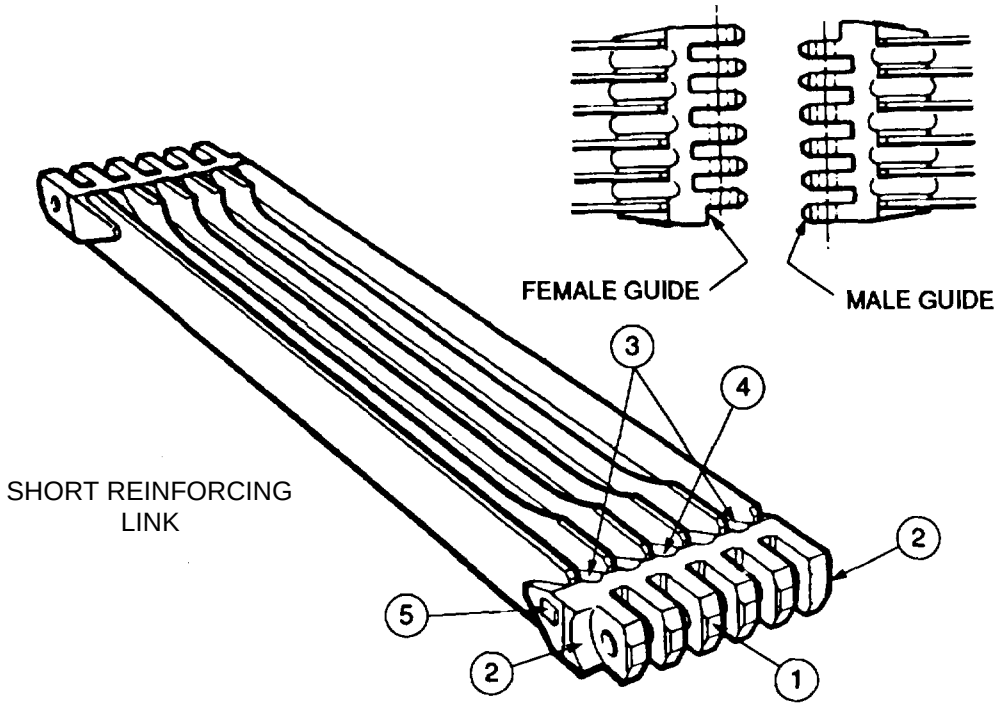
(4) CENTER SLOT For insertion of the toggle bar that connects the light tackle to the link.

(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(13) Short Reinforcing Link

The short reinforcing link is used in double story link reinforced bridges that contain an odd number of bays and is connected to long links with nose pins. The pin jaws of each link have a guide system built into them and these guides allow easy insertion of the nose pin. The nose pin is inserted from the outside toward the inside and secured with a retainer clip. The short link is carried by one person.

The parts of the short link listed below are similar to those of the long link and perform the same functions.



(1) PIN JAWS.

(2) MALE AND FEMALE GUIDE.

(3) OUTER SLOTS.

(4) CENTER SLOTS.

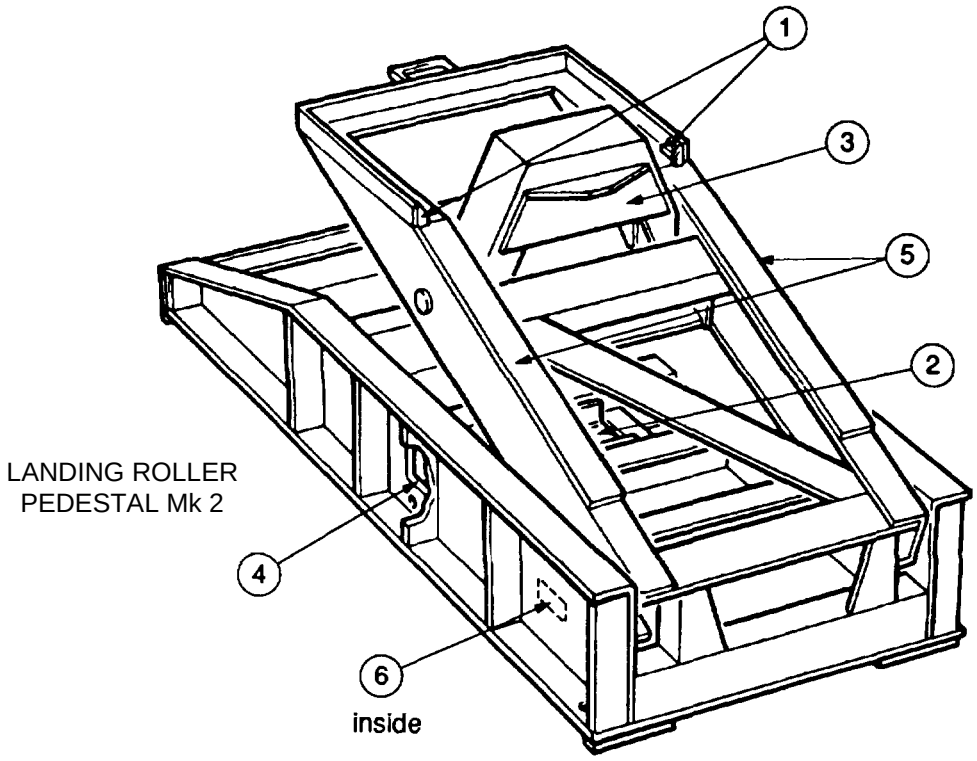
(5) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(14) Landing Roller Pedestal Mk 2 (LRP)

The landing roller pedestal holds the landing roller and receives the launching nose on the far side of the gap. The Mk 2 LRP is used for all link reinforced bridges. The height of the LRP is adjusted with a hydraulic jack (20 ton).

WARNING

Use great care when the pedestal is being raised or lowered. Serious bodily injury may result if LRP is improperly operated.



(1) LUGS. Hold rear of landing roller in position.

(2) JACK SEAT. Base for 20T hydraulic jack used to adjust height of upper frame. Pivot mounted to keep jack seated solidly in frame during operation.

(3) SADDLE. Fits head of jack. Pivot mounted to keep saddle on jack head during operation.

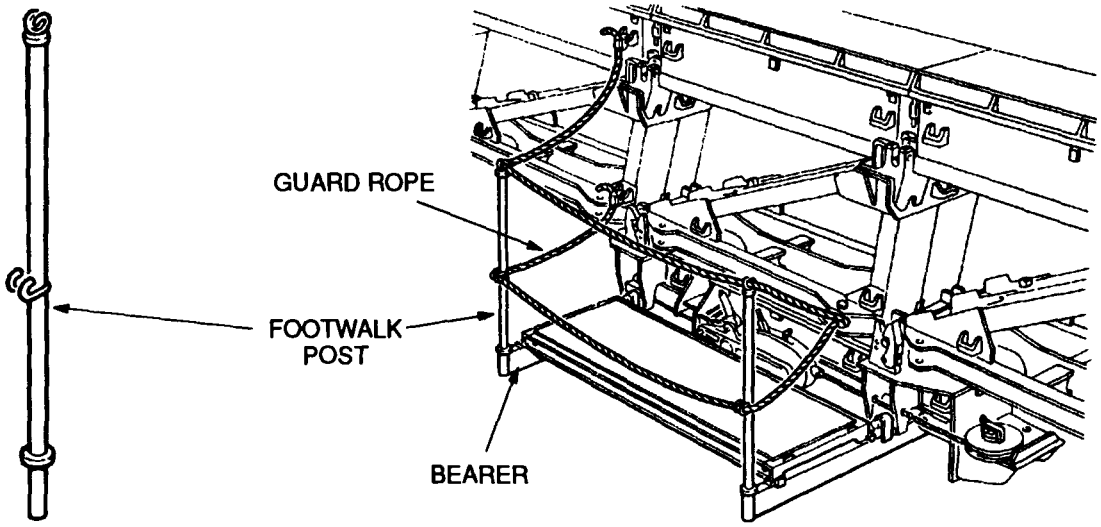
(4) ACCESS HOLES. For safe operation of hydraulic jack.

(5) REINFORCING PLATE. This is plate that is welded to standard LRP to reinforce it. It is one way of identifying a Mk 2.

(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

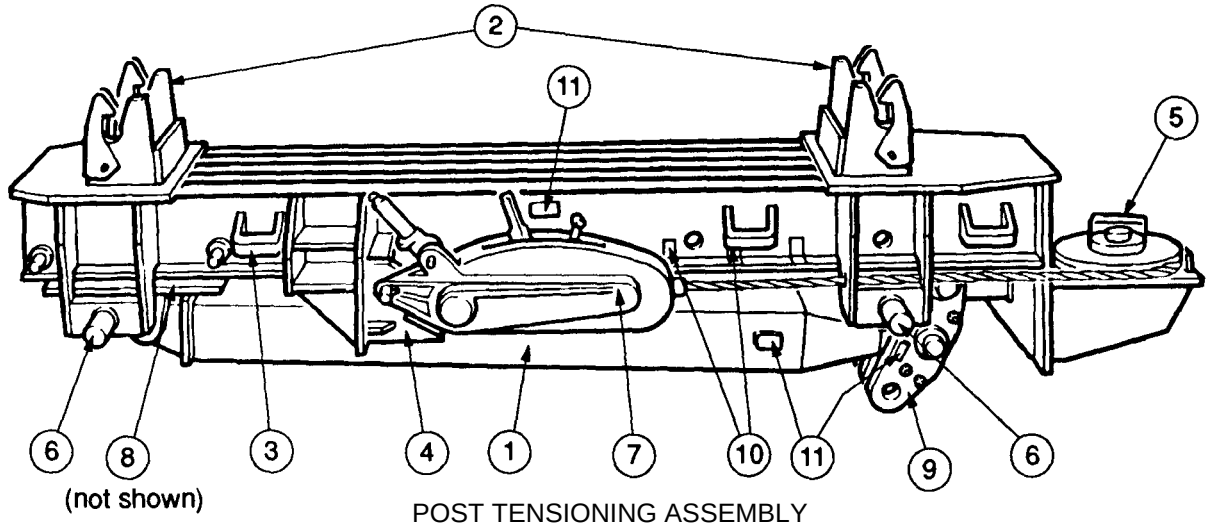
(15) Footwalk Post

The footwalk post is used to provide a guard rail on the post tensioning work platform.



(16) Post Tensioning Assembly (PT)

The post tensioning assembly is used to remove slack from the complete reinforcement system. When the tension post is correctly positioned, nearly vertical, the entire system is tensioned and the bridge is reinforced. There are four assemblies in a bridge. Before loading on a pallet, two must be assembled as right hand, and two as left hand assemblies. This is done by positioning of the cable pullers in one or the other of the alternate positions on the frame. The tensioning post assembly is equipped with six carrying bar brackets which are used for carrying, and for lifting when connecting the assembly to the bridge.



POST TENSIONING ASSEMBLY

(1) REINFORCING POST. Allows tensioning of the system as it is pulled to a near vertical positioning under the bridge.

(2) UPPER JAW CATCH ASSEMBLY. Connects the post tensioning assembly to the panel pins in the lower flange of the bottom panel. The jaws snap into position around the pins and then they are secured with retainer clips.

(3) CARRYING BAR BRACKET For connection of carrying bars used to carry panel. Three brackets on each side. The post assembly is carded by six personnel.

(4) PULLER BRACKET. For connection of cable puller that is used to tension post.

(5) TACKLE BLOCK. For reeving of cable from puller to post. Block is placed in either one of two positions making the assembly either right or left handed.

(6) STUB PINS. For connection of the footwalk bearer to the frame assembly.

(7) CABLE PULLER [with 20 ft (6 m) cable]. Used to pull the reinforcing post to a near vertical position.

(8) BETALIGHT Betalights are provided for attachment to post tensioning assembly. Purpose of Betalight is to illuminate check marks for construction at night.

(9) LINK CONNECTING BLOCK. Connects the post tensioning assembly to the reinforcing links.

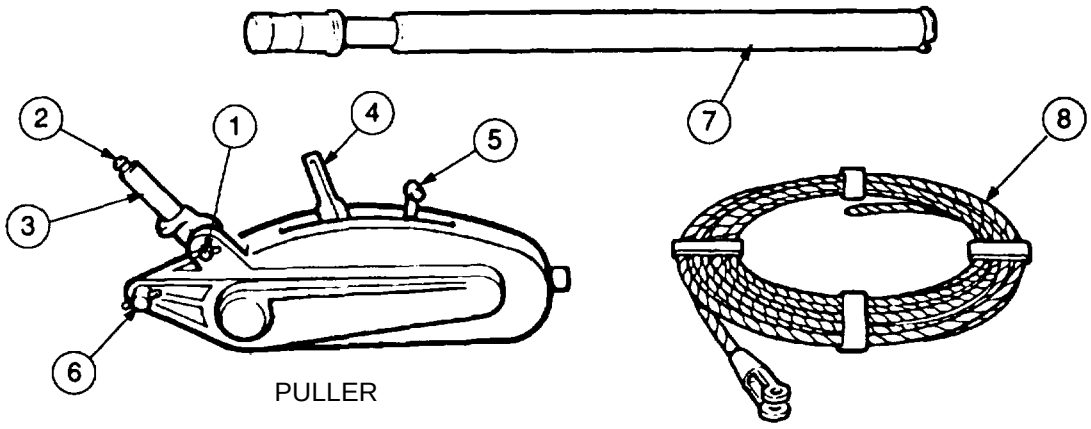
(10) TENSIONING CHECK MARKS. These are four marks painted on the tensioning frame to ensure even progress during tensioning. There is one mark on the sliding block which will align with each of the four marks on the frame during the tensioning operation.

(11) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(17) Puller

The puller is used with the jacking bracket and davits to raise or lower the bridge. It is the same type of puller as the one used on the post tensioning assembly.

CAUTION
Always operate in low gear.



PULLER

(1) GEAR CHANGE CONTROL. For selecting high or low gear by rotating control to required position. Control cannot be rotated until gear change plunger is raised.

(2) GEAR CHANGE BUTTON. Raising the plunger allows gear change control to be rotated.

(3) LEVER OPERATING HANDLE. Operated by handle for taking in cable.

(4) LEVER CONTROL HANDLE. Operated by handle for paying out cable.

(5) HAND CONTROL LEVER. Releases the jaw blocks which grip the cable.

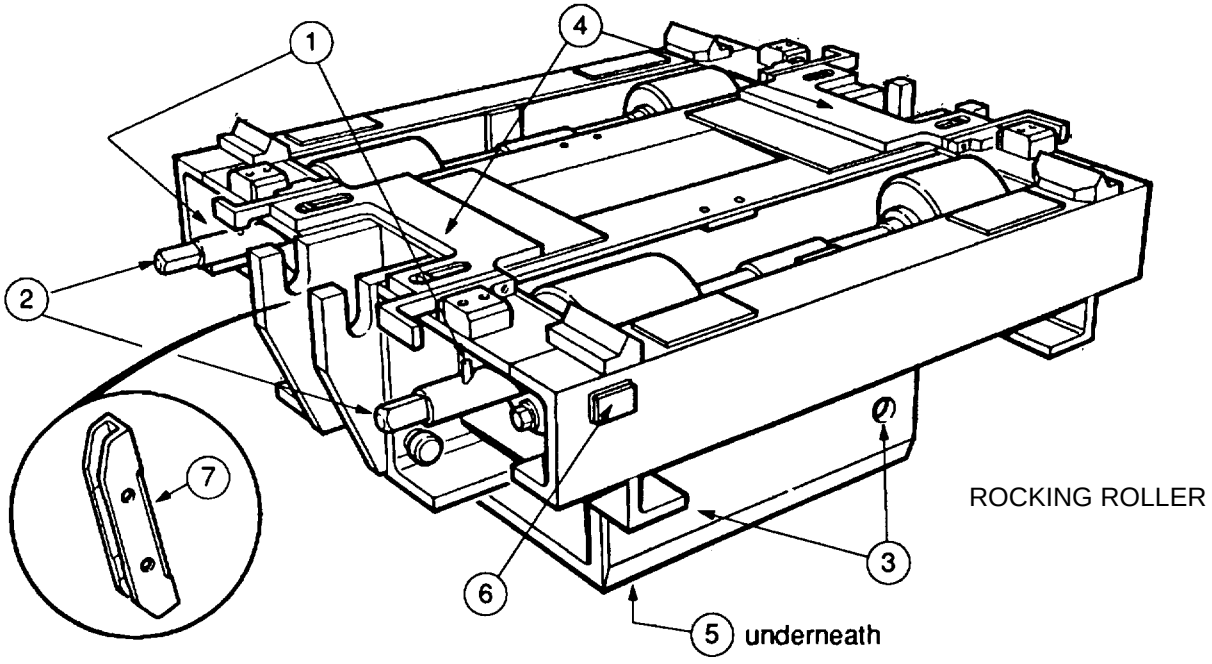
(6) ANCHOR PIN. For connection of puller to jacking bracket, or post tensioning assembly.

(7) HANDLE. For operating item 3 and 4 above. On item 3 handle is pushed on then twisted to lock it in position.

(8) CABLE.

(18) Rocking Roller

The rocking roller is used on the bridging capsill to form the capsill roller beam which is required for 2E + 13 thru 2E + 22 bay DS MGBs with and without reinforcement.



ROCKING ROLLER

(1) UP/DOWN INDICATOR. Indicates whether roller is up or down.

(2) ROLLER SHAFT. This shaft is square ended to allow fitting of the ratchet wrench used to turn the shaft to raise or lower the rollers.

(3) NOSE PIN HOLES. For the nose pins which secure the rollers to the capsill. These nose pins are always secured with retainer clips.

(4) BEARING PADS. Moveable plates on the roller frame that the bridge will sit on when the rollers are turned to the down position; this is called the locked position of the rollers. To unlock, the rollers are raised, and the plates slid outward.

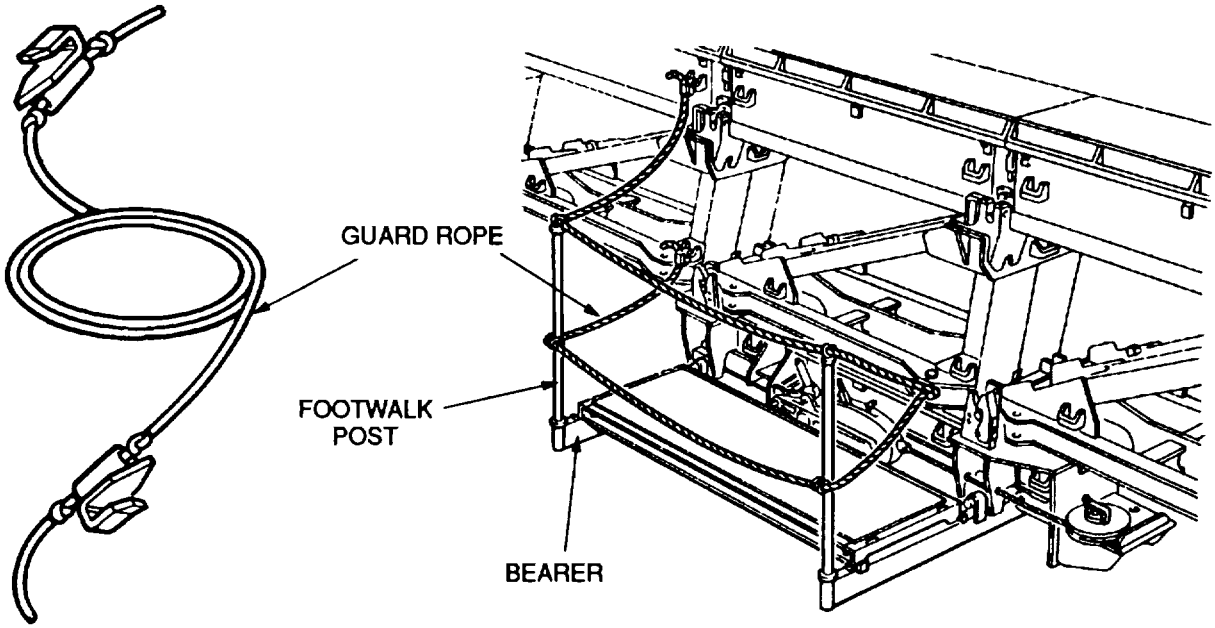
(5) GUIDE HOLES. Used to properly align rocking roller on capsill.

(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(7) LINK. Used on floating MGB. Links to be removed and stored on receipt.

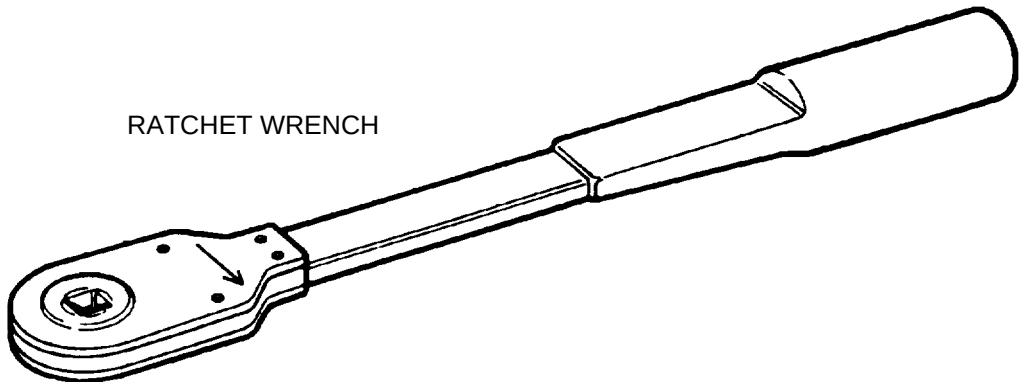
(19) Guard Rope

The guard rope is used on the footwalk posts to provide a guard rail, for the safety of the tensioning post work party.



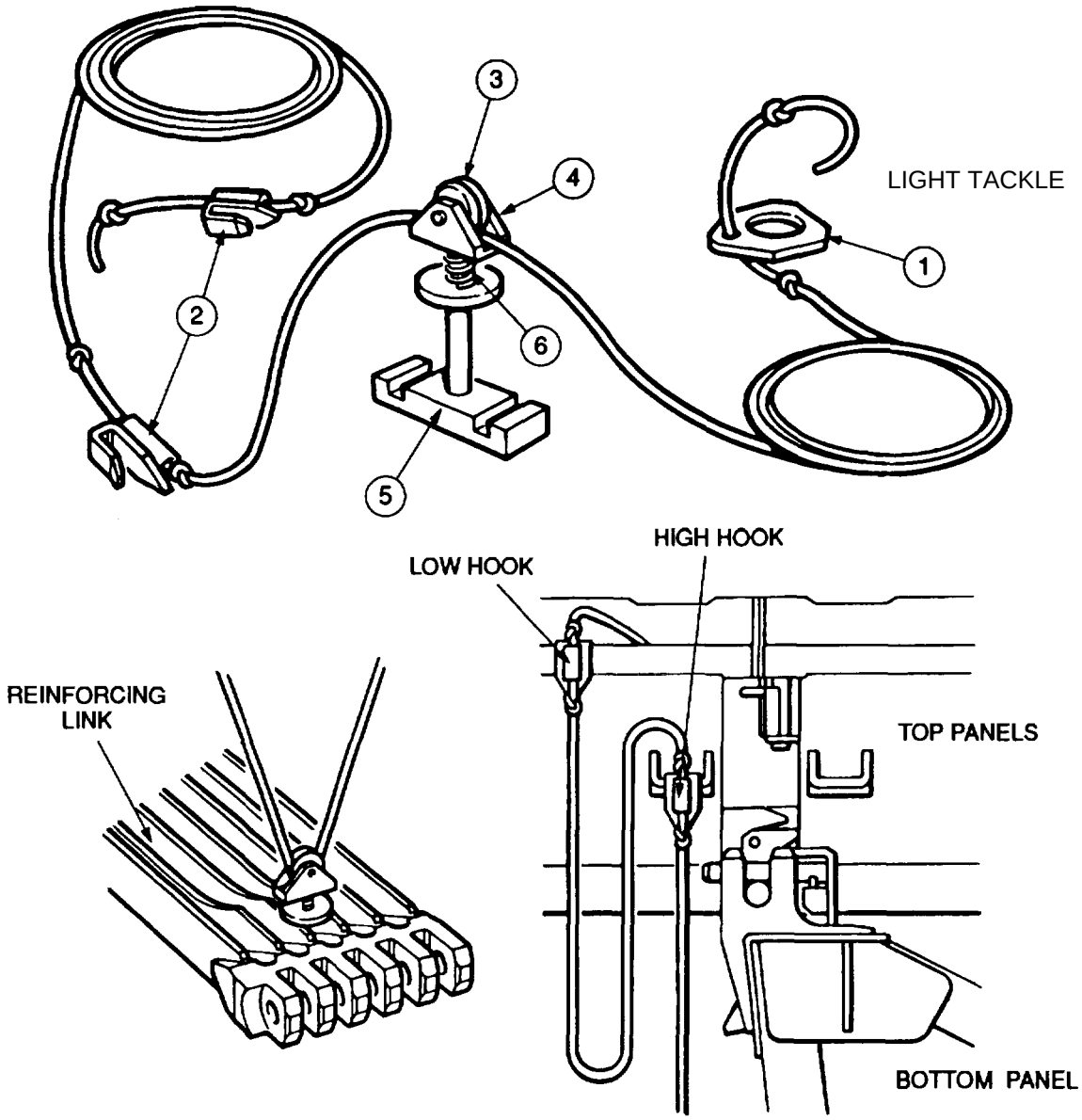
(20) Ratchet Wrench 3/4 in

The ratchet wrench is used to turn the roller shafts of the rocking roller to raise or lower the rollers.



(21) Light Tackle (LT)

Light tackle Is used to support the reinforcing links as a slack link chain under the bridge, during building and booming. It lowers the link chain to its final position 7 ft (2.1 m) under each girder.



(1) PLATE. Fits on protruding end of panel pin in bottom panel, on inside of bridge. Secured to end of pin with a retainer clip.

(2) HOOKS. Fit on a carrying bar bracket of top panel, on outside of bridge. The hook closest to the end of the tackle is the LOW position hook. The LOW position hook is connected to the top panel carrying bar bracket after the bridge is jacked down. The other hook is the HIGH position hook. It is connected to the top panel bracket during building and booming.

(3) PULLEY. Allows the rope to ride through the block during changing of the hooks to a different position.

(4) BLOCK. The pulley and toggle bar are fitted to the block.

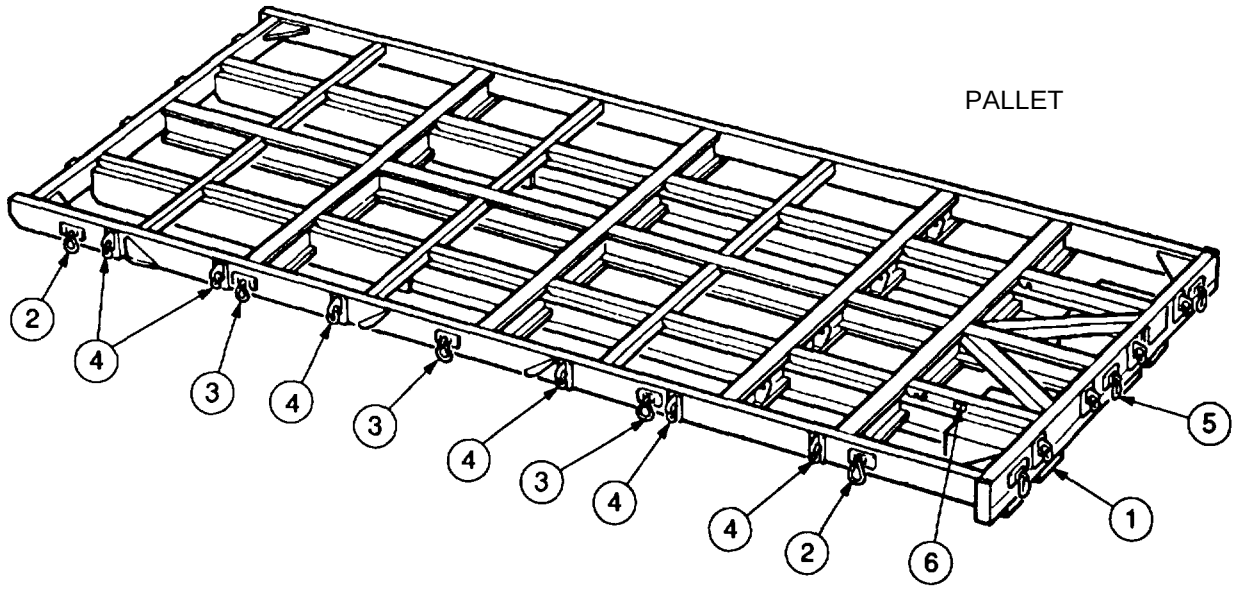
(5) TOGGLE BAR. Connects the tackle to the link.

(6) SPRING. Keeps the toggle bar in the locked position.

d. Support Equipment. The support equipment needed to transport, and load/unload the bridge and erection components is illustrated and explained in this section. The truck and trailer illustrated in paragraphs (2) and (3) are typical and are not part of the bridge, erection and link sets.

(1) Pallet

The pallet is used to hold the bridge and erection parts for crane loading of trucks and trailers. It permits fast off-loading of trucks and trailers, by dumping or pulling loads off.



(1) RUBBER BUFFER. Absorbs initial shock when rear of pallet hits the ground.

(2) PALLET LIFTING RINGS. Used with lifting slings on crane to lift loaded pallets onto trucks and trailers.

(3) PALLET TIE-DOWN RINGS. Used to secure pallet on truck or trailer.

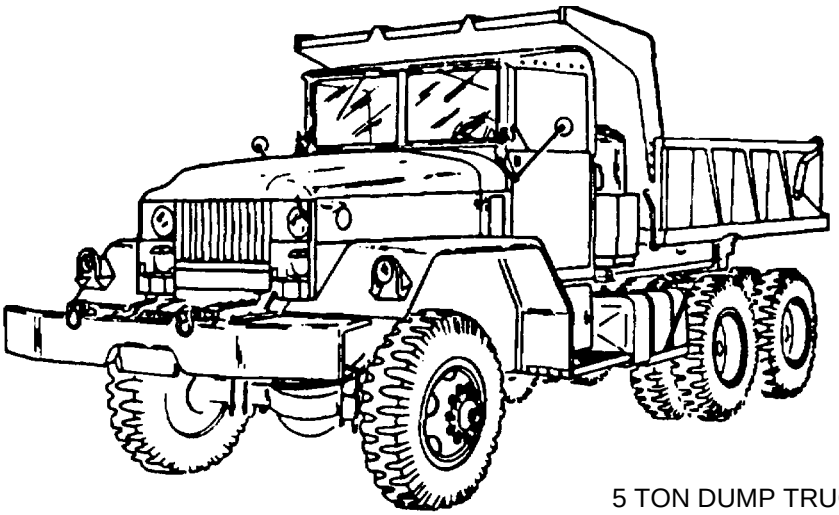
(4) SHACKLES. Used to hold parts on pallets.

(5) EXTRACTOR (Same as item 3). For connection of extractor cable to remove pallets from trailer, or truck it needed.

(6) IDENTIFICATION PLATE. The component serial number is marked on this plate.

(2) Truck, 5 Ton Dump (Tactical Models)

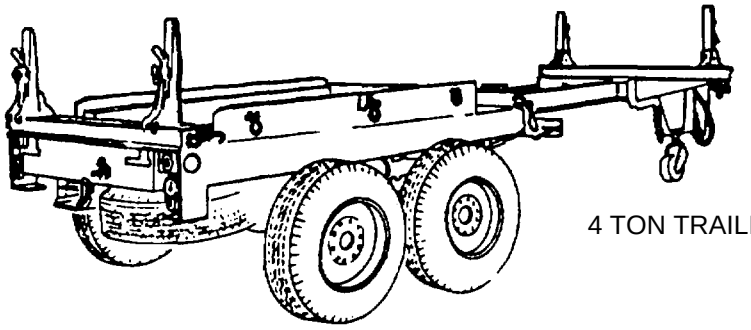
The dump truck is the primary means of transporting one pallet load of bridge components, and for pulling one trailer loaded with components. It is used as the launching vehicle for bridge booming/launching, and retrieval of bridge.



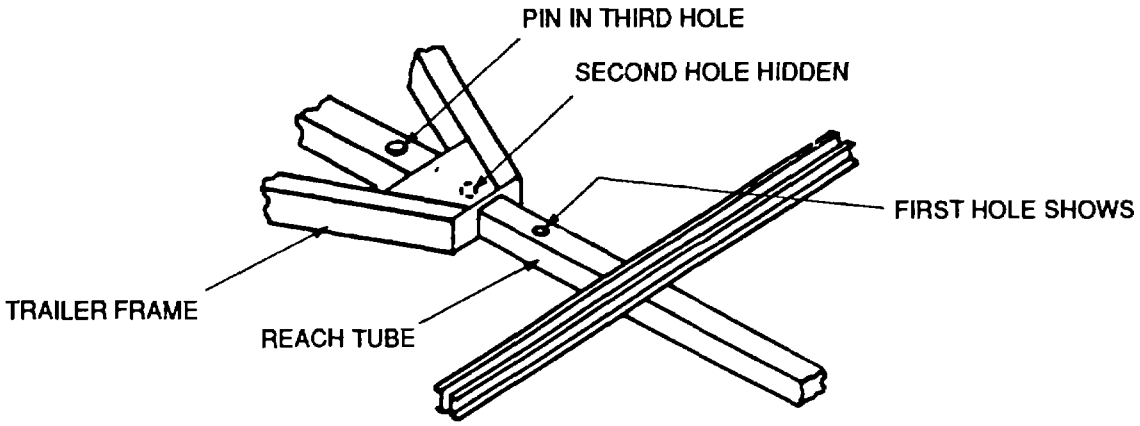
5 TON DUMP TRUCK

(3) Trailer, 4 Ton (Boister Trailer)

The trailer is used to carry one pallet of bridge parts, when fitted with the pallet adapter.

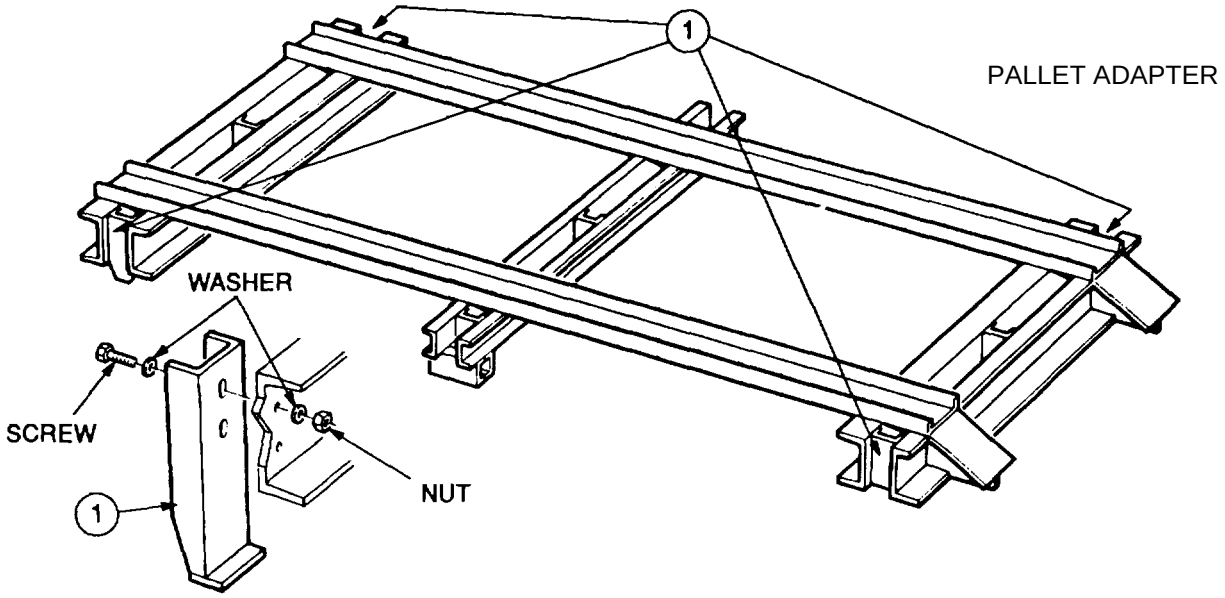


4 TON TRAILER



(4) Pallet Adapter

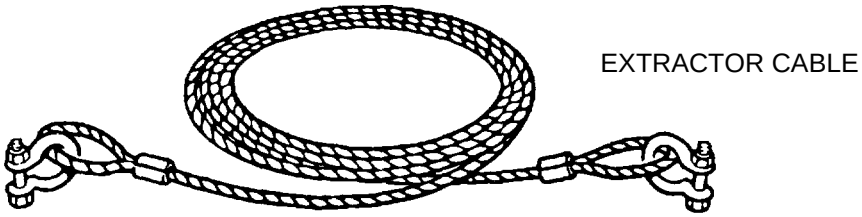
The pallet adapter is needed to ft and secure the pallet to the trailer Perms trailer to be pulled out from under pallet for off-loading.

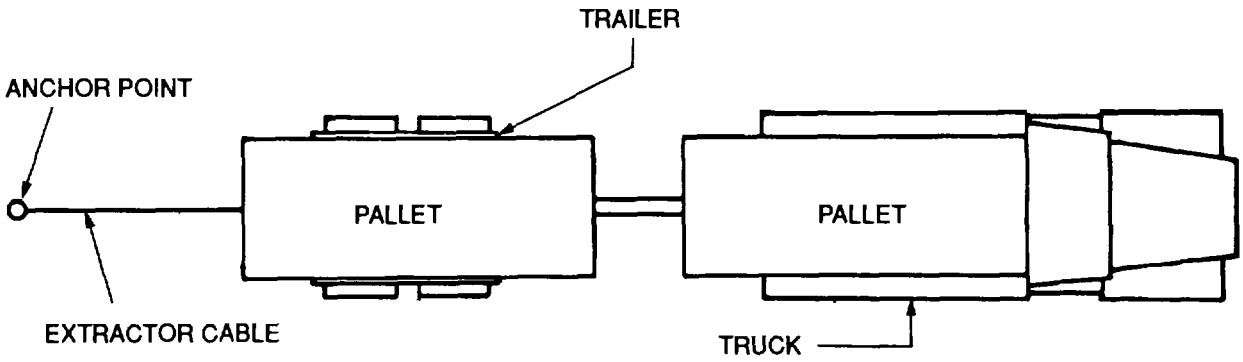


(1) ADAPTER BRACKETS. Secure to trailer with screws, washers and nuts.

(5) Extractor Cable

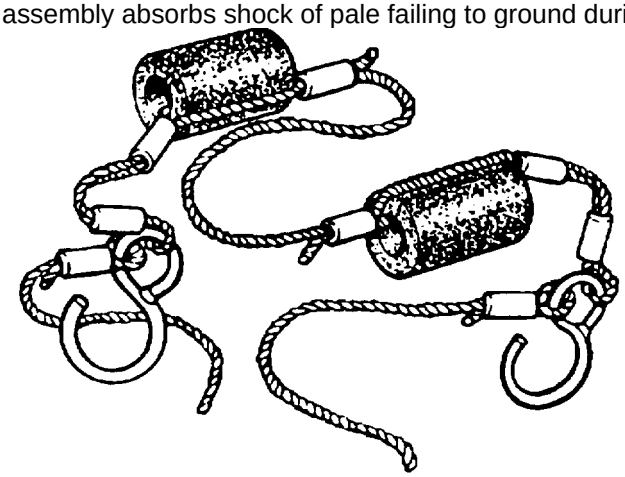
The extractor cable connects the pallet on the trailer to an anchor pin so that the trailer can be driven out from under the pallet. The cable is used with o shackles.





(6) Pallet Rear Buffer Assembly

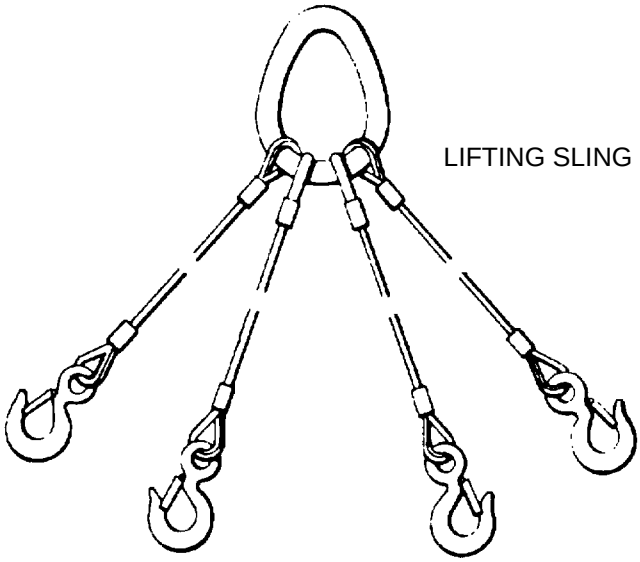
The rear buffer assembly absorbs shock of pale failing to ground during off-loading.



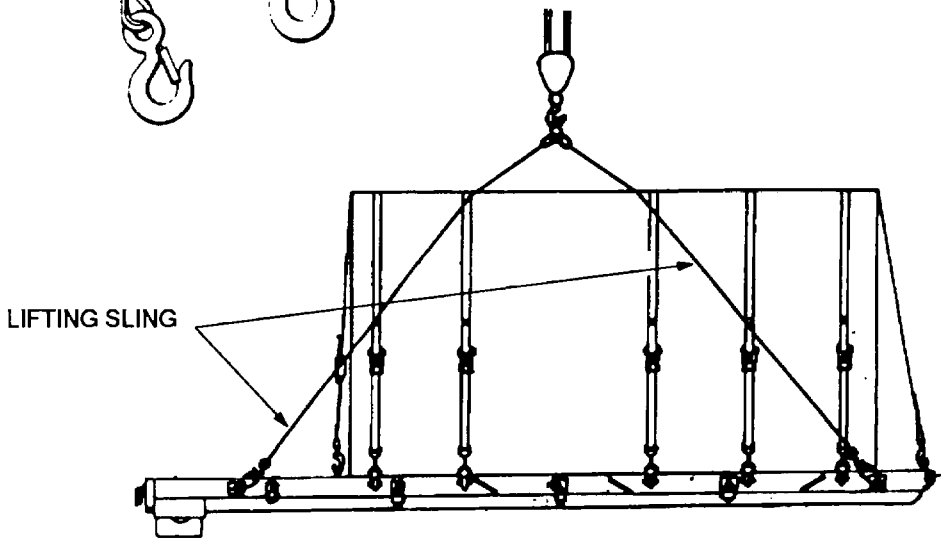
PALLET REAR
BUFFER ASSEMBLY

(7) Lifting Sling

The lifting sling is used to lit pallets onto trucks and trailers.



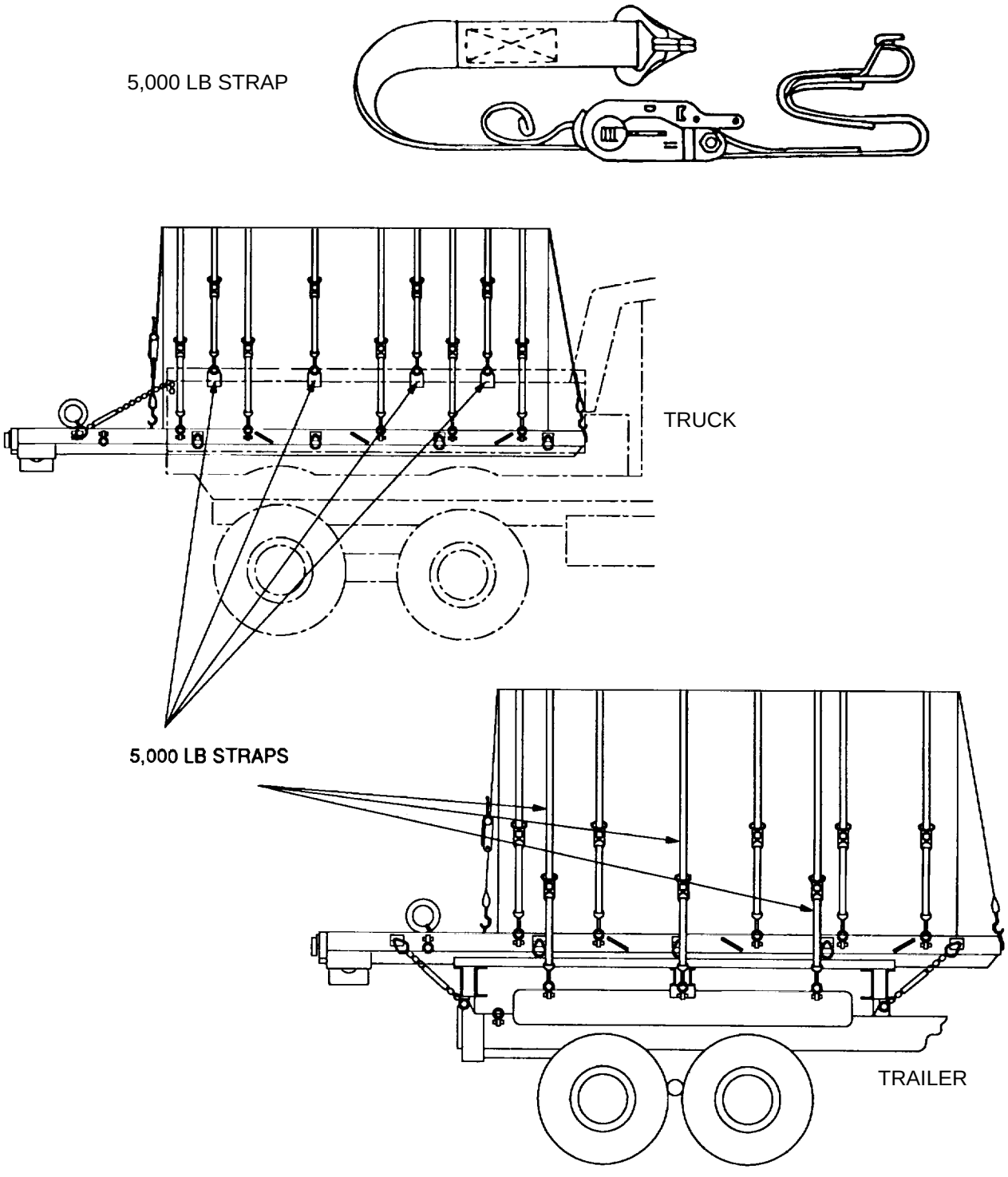
LIFTING SLING



LIFTING SLING

(8) Strap, 5,000 lb.

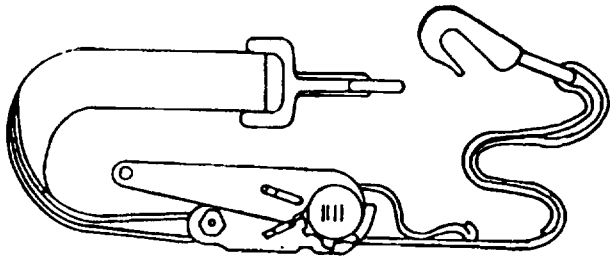
The strap is used to secure added pallets on the dump truck and the trailer. It can also be used to secure the landing roller pedestal on the tip of the launching nose during launch of bridge.

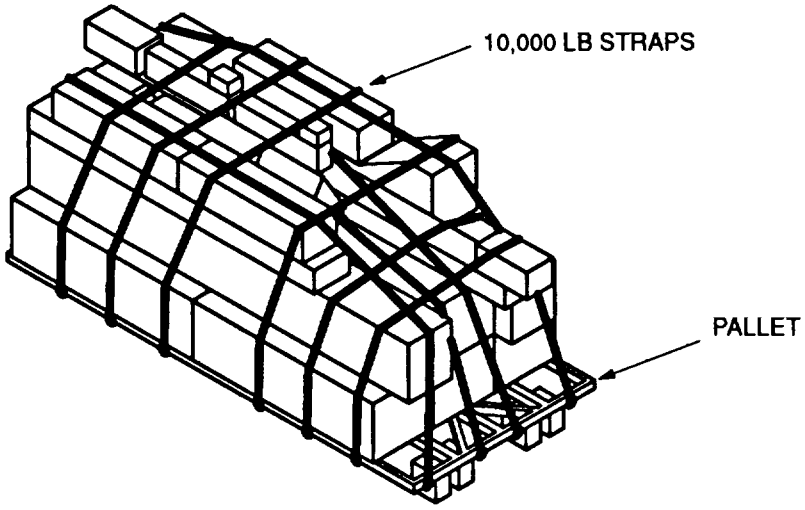


(9) Strap, 10,000 lb.

The strap is used to secure the components on the pallet. It can also be used to secure the landing roller pedestal on the tip of the launching nose during launch of bridge. It is also used around the bays of the bridge during disassembly of double story on the far bank.

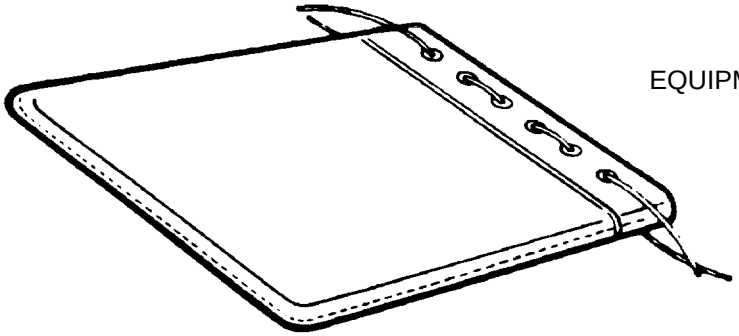
10,000 LB STRAP





(10) Equipment Bag

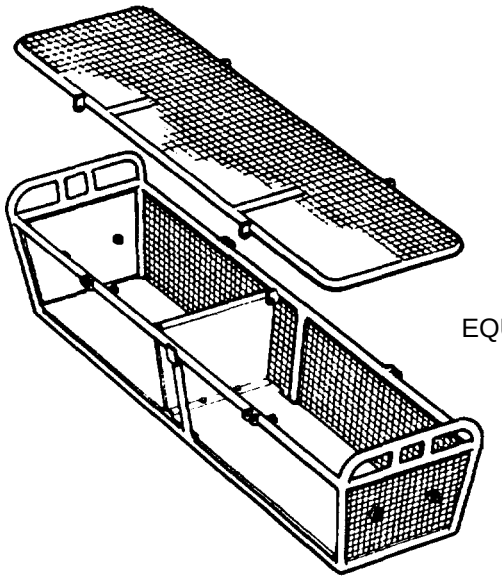
The equipment bag is used to hold retainer clips.



EQUIPMENT BAG

(11) Equipment Basket

The equipment basket used to ho smaller bridge and erection parts, such as panel pins, nose pins, bracing pins and jacks.

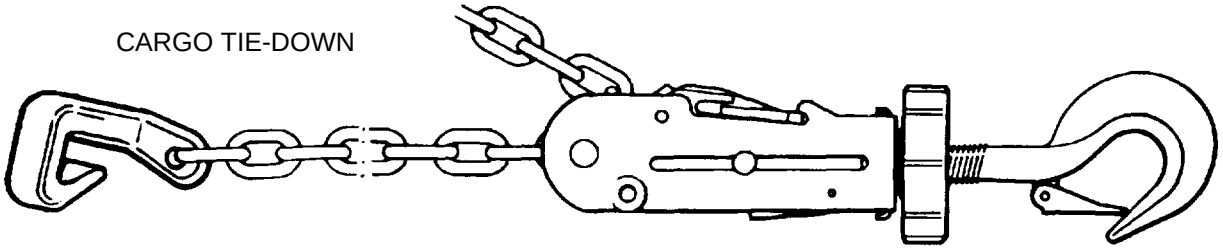


EQUIPMENT BASKET

(12) Tie-Down, Cargo, Aircraft, MB-1

The tie-down is used to secure pallets on truck and trailer.

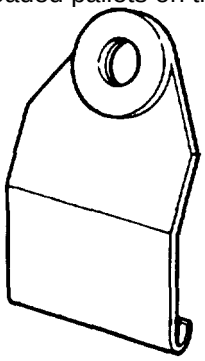
CARGO TIE-DOWN



(13) T Down Lug

The tie-down lug is used with 5,000 lb traps to secure loaded pallets on trucks.

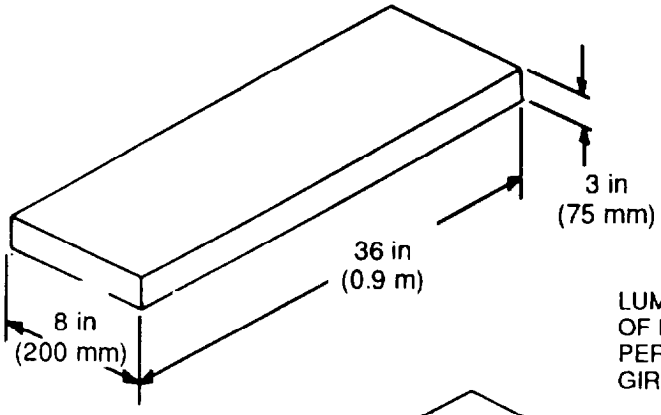
TIE-DOWN LUG



(14) Packing

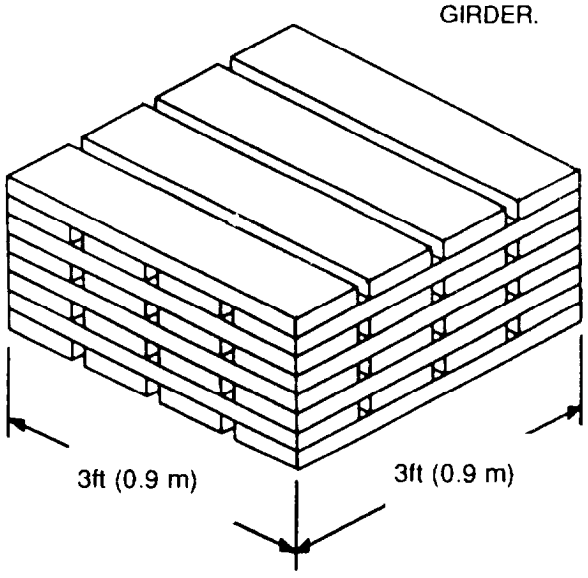
Packing is used under baseplates, landing roller and pedestal, and the end of bridge to provide solid bearing, and to raise these items off the ground when needed. It is used in pallet loads to take up space between components so that loads can be tightly secured. Packing sizes are as follows:

3 in x 8 in x 36 in (75 x 200 x 900 mm)
3 in x 8 in x 84 in (75 x 200 x 2133 mm) [4 pieces] [for use with Link Reinforcement Set]



LUMBER USED IN TOP LAYER OF BRIDGE PACKING MUST BE PERPENDICULAR TO BRIDGE GIRDER.

PACKING



1-10 EQUIPMENT DATA

Adjustable Support

Length	5 ft 5 in (1.65 m)
Width	7 in (0.18 m)
Height	3 ft 8 in (1.12 m)
Weight	143 lb (65 kg)
	Carried by 2 personnel
No. in set	6 (erection)
	2 (link)

Anchor Assembly (AA)

Length	10 ft 9-1/2 in (3.29 m)
Width	2 ft 3-5/8 in (0.70 m)
Height	11-3/16 in (0.28 m)
Weight	362 lb (164 kg)
	Carried by 4 personnel
No. in set	5 (link)

Anchorage Pin Assembly

Length	2 ft 9-7/8 in (0.86 m)
Diameter	1-3/4 in (0.04 m)
Weight	26 lb (11.8 kg)
	Carried by 1 person
No. in set	10 (link)

Anti-Flutter Tackle (AF)

Length	9 ft 10 in (3.00 m)
Weight	4.4 lb (2 kg)
	Carried by 1 person
No. in set	5 (link)

Bankseat Beam (BSB)

Length	13 ft 3-1/2 in (4.06 m) overall
Width	1 ft 6 in (0.46 m) overall
Height	1 ft 9-3/8 in (0.54 m) overall
Weight	570 lb (258 kg)
	Carried by 6 personnel
No. in set	7 (bridge)

Baseplate (Single Story)

Length	2 ft 3/8 in (0.62 m)
Width	1 ft 5-1/4 in (0.44 m)
Height	7-3/4 in (0.20 m)
Weight	32 lb (14.5 kg)
	Carried by 1 person
No. in set	2 (erection)

Baseplate (Double Story)

Length	5 ft 4 in (1.63 m)
Width	1 ft 11 in (0.58 m)
Height	6-3/4 in (0.17 m)
Weight	93 lb (42 kg)
	Carried by 2 personnel
No. in set	6 (erection)
	4 (link)

Bottom Panel (BP)

Length	6 ft 5 in (1.96 m) overall
	6 ft (1.83 m) effective
Width	2 ft 3 in (0.69 m) overall
Height	3 ft 7-3/8 in (1 .1 m)
Weight	435 lb (197 kg)
	Carried by 4 personnel
No. in set	26 (bridge)

Bracing Pin

Length	7-1/4 in (0.18 m)
Diameter	1 in (2.54 cm)
Weight	1-1/2 lb (0.68 kg)
	Carried by 1 person
No. in set	68 (bridge)
	8 (erection)
	22 (link)

Bracket Adapter: (Trailer) Pallet:

Length	9-1/2 in
Width	5 in
Weight	12 lb (5.45 kg)
	Carried by 1 person
No. in set	20 (bridge)
	4 (erection)
	4 (link)

Bridge Marker Guide

Length	4 ft 5 in (1.35 m) min.
	5 ft 11 in (1.80 m) max.
Weight	5-1/4 lb (2.4 kg)
	Carried by 1 person
No. in set	24 (bridge)

Building Pedestal (BP)

Length	2 ft 1/2 in (0.62 m)
Width	1 ft 7 in (0.48 m)
Height	1 ft 4 in (0.41 m)
Weight	16 lb (7.25 kg)
	Carried by 1 person
No. in set	7 (erection)

Capsill

Length	15 ft 5-7/16 in (4.71 m)
Width	2 ft 6 in (0.76 m)
Height	1 ft 2-5/8 in (0.37 m)
Weight	400 lb (181 kg)
	Carried by 6 to 8 personnel
No. in set	2 (link)

Capsill Pin

Length	1 ft 8-1/2 in (0.52 m)
Diameter	1-1/2 in (0.04 m)
Weight	10 lb (4.5 kg)
	Carried by 1 person
No. in set	3 (link)

Carrying Bar

Length	2 ft 4-1/2 in (0.72 m)
Diameter	1-3/4 in (0.04 m)
Weight	4 lb (1.8 kg)
	Carried by 1 person
No. in set	46 (erection)

Carrying Handle

Length	1 ft 3/8 in (0.31 m)
Width	5-1/2 in (0.14 m)
Weight	1.25 lb (0.56 kg)
	Carried by 1 person
No. in set	46 (erection)

Curb

Length	5 ft 11 in (1.8 m)
Width	5-3/8 in (0.14 m)
Height	1 ft 1-1/2 in (0.34 m)
Weight	70 lb (32 kg)
	Carried by 1 person
No. in set	42 (bridge)

Davit Post Assembly

Length	9 ft 5-7/8 in (2.89 m)
Width	5 ft 5-3/16 in (1.66 m)
Height	11-7/8 in (0.30 m)
Weight	192 lb (87 kg)
	Carried by 4 personnel
No. in set	2 (link)

Deck

Length	9 ft 1 in (2.77 m) overall
Width	1 ft 5-1/4 in (0.44 m) overall
Height	6-7/8 in (0.17 m)
Weight	163 lb (74 kg)
	Carried by 2 personnel
No. in set	74 (bridge)

End Taper Panel (ETP)

Length	13 ft 2-5/8 in (4.03 m) overall
Width	2 ft 4 in (0.71 m)
Height	1 ft 5-3/4 in (0.45 m)
Weight	600 lb (272 kg)
	Carried by 6 personnel
No. in set	5 (bridge)

Equipment Bag

Length	1 ft 2 in (0.36 m)
Width	10 in (0.25 m)
Weight	5/8 lb (0.28 kg)
	Carried by 1 person
No. in set	8 (bridge)
	2 (erection)
	2 (link)

Equipment Basket

Length	4 ft 9 in (1.45 m)
Width	1 ft 3 in (0.38 m)
Height	1 ft (0.30 m)
Weight	62 lb (28 kg) (empty)
	Carried by 2 personnel
No. in set	14 (bridge)
	6 (erection)
	4 (link)

Extractor Cable

Length	20 ft (6.10 m)
Weight	22 lb (10 kg)
	Carried by 1 person
No. in set	1 (erection)

Fixed Support

Length	1 ft 4-1/2 in (0.42 m)
Width	1 ft (0.3 m)
Height	9-1/2 in (0.24 m)
Weight	14 lb (6.35 kg)
	Carried by 1 person
No. in set	7 (erection)

Footwalk

Length	5 ft 11-7/8 in (1.83 m)
Width	2 ft 2-7/8 in (0.68 m)
Depth	2-11116 in (0.07 m)
Weight	54 lb (24.5 kg)
	Carried by 1 person
No. in set	5 (link)

Footwalk Bearer

Length	5 ft 3/8 in (1.53 m)
Width	2-3/4 in (0.07 m)
Depth	7-3/4 in (0.20 m)
Weight	17 lb (7.7 kg)
	Carried by 1 person
No. in set	10 (link)

Footwalk Post

Length	4 ft 3/8 in (1.23 m)
Width	3-13/16 in (0.94 m)
Depth	2-15/16 in (0.75 m)
Weight	2.6 lb (1.2 kg)
	Carried by 1 person
No. in set	10 (link)

Frame Cross Girder

Length	14 ft 3-1/4 in (4.35 m)
Width	1 ft 8 in (0.51 m)
Height	1 ft 3 in (0.38 m)
Weight	171 lb (77.5 kg)
	Carried by 2 personnel
No. in set	3 (erection)

Guard Rope

Length	30 ft (9.14 m)
Weight	2 lb (0.9 kg)
	Carried by 1 person
No. in set	4 (link)

Hammer

Weight	1.5 lb (0.7 kg)
	Carried by 1 person
No. in set	6 (link)

Headless Panel Pin

Length	2 ft 5 in (0.74 m)
Diameter	1-3/4 in (4.44 cm)
Weight	19 lb (8.62 kg)
	Carried by 1 person
No. in set	5 (bridge)
	1 (link)
	2 (erection)

Hydraulic Jack 15T

Height	1 ft 7 in (0.48 m) minimum 2 ft 8 in (0.81 m) extended
Weight	47 lb (21 kg) Carried by 1 person
No. in set	7 (erection)

Hydraulic Jack 20T

Height	1 ft 6-1/2 in (0.47 m) minimum 2 ft 6-1/2 in (0.78 m) maximum
Weight	47 lb (21 kg) Carried by 1 person
No. in set	3 (link)

Jack Post

Length	2 ft 10-3/4 in (0.88 m)
Width	6 in (0.15 m)
Height	11 in (0.28 m)
Weight	43 lb (19.5 kg) Carried by 1 person
No. in set	4 (erection)

Jack Seat

Length	9-1/4 in (0.23 m)
Width	1 ft (0.3 m)
Height	5 in (0.13 m)
Weight	6 lb (2.7 kg) Carried by 1 person
No. in set	5 (erection) 2 (link)

Jack Support

Length	1 ft 3 in (0.38 m)
Width	9 in (0.23 m)
Height	10-1/2 in (0.26 m)
Weight	12 lb (5.5 kg) Carried by 1 person
No. in set	5 (erection)

Jacking Bracket

Length	4 ft 8-1/2 in (1.44 m)
Width	1 ft 2-7/16 in (0.36 m)
Height	1 ft 6 in (0.46 m)
Weight	135 lb (61.2 kg) Carried by 2 personnel
No. in set	3 (link)

Junction Panel (JP)

Length	3 ft 5-1/4 in (1.05 m) overall 3 ft (0.91 m) effective
Width	2 ft 1-1/2 in (0.66 m)
Height	5 ft 3/4 in (1.54 m)
Weight	478 lb (217 kg.) Carried by 4 personnel
No. in set	5 (bridge)

Landing Roller (LR)

Length	1 ft 4 in (0.4 m)
Width	1 ft 10-1/2 in (0.57 m)
Height	11 in (0.28 m)
Weight	61 lb (27.7 kg) Carried by 1 person
No. in set	4 (erection) 2 (link)

Landing Roller Pedestal Mk 1 (LRP)

Length	5 ft 7 in (1.7 m)
Width	2 ft 6-5/8 in (0.8 m)
Height	1 ft 2-1/2 in (0.37 m)
Weight	215 lb (97.5 kg) Carried by 4 personnel
No. in set	2 (erection)

Landing Roller Pedestal Mk 2 (LRP)

Length	5 ft 7 in (1.7 m)
Width	2 ft 6-5/8 in (0.78 m)
Height	1 ft 2-1/2 in (0.37 m)
Weight	218 lb (99 kg) Carried by 4 personnel
No. in set	3 (link)

Launching Nose Cross Girder (LNCG)

Length	8 ft 7-1/2 in (2.63 m)
Width	10-1/4 in (0.26 m)
Height	1 ft 6 in (0.46 m)
Weight	157 lb (71 kg) Carried by 2 personnel
No. in set	1 (erection)

Launching Nose Cross Girder Post

Length	5 ft 10 in (1.8m)
Width	4 in (0.1 m)
Height	7-1/4 in (0.18 m)
Weight	32 lb (14.5 kg)
	Carried by 1 person
No. in set	4 (erection)

Launching Nose Heavy (LNH)

Length	10 ft 4-3/4 in (3.17 m) overall
	10 ft (3.05 m) effective
Width	1 ft 6 in (0.46 m)
Height	2 ft 1 in (0.63 m)
Weight	386 lb (175 kg)
	Carried by 4 personnel
No. in set	8 (erection)
	6 (link)

Launching Nose Link (LNL)

Length	2 ft 7 in (0.79 m)
Width	6 in (0.15 m)
Weight	11 lb (5 kg)
	Carried by 1 person
No. in set	3 (link)

Launching Nose Pin

Length	1 ft 5-1/8 in (0.44 m)
Diameter	1-1/4 in (0.03 m)
Weight	6 lb (2.72 kg)
	Carried by 1 person
No. in set	23 (erection)
	40 (link)

Launching Nose Roller (LNR)

Height	2 ft 9-3/4 in (0.86 m)
Width	2 ft 1 in (0.64 m)
Depth	7 in (0.18 m)
Weight	62 lb (28 kg)
	Carried by 1 person
No. in set	2 (erection)

Lifting Sling

Length	16 ft (4.88 m)
Weight	150 lb (68 kg)
	Carried by 2 personnel
No. in set	1 (erection)

Light Launching Nose Front (LLNF)

Length	10 ft (3.05 m)
Width	1 ft 1-1/4 in (0.34 m)
Height	8-1/4 in (0.21 m)
Weight	97 lb (44 kg) Carried by 2 personnel
No. in set	5 (erection)

Light Launching Nose Rear (LLNR)

Length	10 ft 5 in (3.17 m) overall 10 ft (3.05 m) effective
Width	1 ft 1-1/4 in (0.34 m)
Height	2 ft (0.61 m)
Weight	148 lb (67 kg) Carried by 2 personnel
No. in set	5 (erection)

Light Tackle (LT)

Length	25 ft (7.62 m)
Weight	2 lb (0.9 kg) Carried by 1 person
No. in set	20 (link)

Long Ramp

Length	14 ft 1/2 in (4.28 m) overall 14 ft (4.27 m) effective
Width	1 ft 10 in (0.56 m) overall
Height	1 ft (0.3 m)
Weight	400 lb (181 kg) Carried by 4 personnel
No. in set	15 (bridge)

Long Reinforcing Link

Length	12 ft 3-1/2 in (3.75 m)
Width	1 ft 2-1/16 in (0.36 m)
Depth	3-15/16 in (0.10 m)
Weight	125 lb (57 kg) Carried by 2 personnel
No. in set	20 (link)

Longitudinal Girder

Length	14 ft 4-1/2 in (4.38 m)
Width	1 ft 7-3/4 in (0.50 m) overall
Height	5-1/4 in (0.13 m)
Weight	109 lb (49 kg) Carried by 2 personnel
No. in set	3 (erection)

Packing Timber

(For use under bridge as packing to increase bearing)

Dimensions	3 in x 8 in x 36 in (0.08 m x 0.2 m x 0.9 m)
Weight	20 lb (9.1 kg)
No. in set	144 (erection)

(For use in packing skid when constructing bridges with LRS)

Dimensions	3 in x 8 in x 84 in (0.08 m x 0.2 m x 2.13 m)
Weight	50 lb (22.7 kg)
No. in set	4 (link)

Pallet

Length	14 ft 3 in (4.34 m) overall 14 ft (4.27 m) effective
Width	6 ft 9-1/4 in (2.06 m) overall 6 ft 4 in (1.93 m) effective
Height	1 ft (0.30 m)
Weight	710 lb (322 kg) Carried by 8 personnel (minimum)
No. in set	11 (bridge) 3 (erection) 2 (link)

Pallet Adapter

Length	9 ft 1 in (2.77 m)
Width	4 ft 10 in (1.47m)
Height	10 in (0.25 m)
Weight	400 lb (181 kg) Carried by 4 personnel
No. in set	5 (bridge) 1 (link) 1 (erection)

Panel Erection Aid

Length	7 ft (2.1 m)
Width	1 ft 11-3/4 in (0.60 m)
Height	1 ft (0.30 m)
Weight	69 lb (31.3 kg) Carried by 2 personnel
No. in set	3 (erection)

Panel Pin

Length	2 ft 4-1/2 in (0.72 m)
Diameter	1-3/4 in (4.44 cm)
Weight	19 lb (8.62 kg) Carried by 1 person
No. in set	92 (bridge) 20 (erection) 1 (link)

Post Tensioning Assembly (PT)

Length	9 ft 4-1/16 in (2.85 m)
Width	2 ft 3-3/4 in (0.71 m)
Height	2 ft 10-1/16 in (0.87 m)
Weight	657 lb (298 kg)
	Carried by 6 personnel
No. in set	5 (link)

Puller

Length	2 ft 4-1/4 in (0.71 m)
Weight	33 lb (15 kg)
	Carried by 1 person
No. in set	7 (for davit posts and jacking brackets and post tensioners) (link)

Push Bar Adapter

Length	4 ft 3 in (1.30 m)
Width	1 ft 3/4 in (0.32 m)
Height	3-1/4 in (0.08 m)
Weight	100 lb (45 kg)
	Carried by 2 personnel
No. in set	2 (erection)

Push Bar Cross Girder (PBCG)

Length	9 ft 3-1/4 in (2.83 m)
Width	6 in (0.15 m)
Depth	10 in (0.25 m)
Weight	86 lb (39 kg)
	Carried by 2 personnel
No. in set	2 (erection)

Push Bar Long (PB)

Length	15 ft 8-3/16 in (4.78 m)
Width	4-5/8 in (0.12 m)
Depth	4-1/16 in (0.10 m)
Weight	119 lb (54 kg)
	Carried by 2 personnel
No. in set	2 (link)

Push Bar Short (PB)

Length	10 ft 7-1/4 in (3.23 m)
Width	4 in (0.1 m)
Depth	4 in (0.1 m)
Weight	95 lb (43 kg)
	Carried by 2 personnel
No. in set	2 (erection)
	2 (link)

Ratchet Wrench 3/4 in

Length	1 ft 10-1/2 in (0.57 m)
Weight	5 lb (2.3 kg)
	Carried by 1 person
No. in set	3 (link)

Retainer Clip

Length	4-1/8 in (0.1 m)
Weight (bag of 50)	2 lb (0.91 kg)
	Carried by 1 person
No. in set	200 (bridge)
	56 (erection)
	150 (link)

Rocking Roller

Length	2 ft 1-9/16 in (0.65 m)
Width	2 ft 11-7/16 in (0.90 m)
Height	1 ft 1-11/16 in (0.35 m)
Weight	235 lb (107 kg)
	Carried by 4 personnel
No. in set	3 (link)

Roller Beam (RB)

Length	15 ft 5-1/2 in (4.71 m)
Width	11 in (0.28 m)
Height	1 ft 5-7/8 in (0.45 m)
Weight	320 lb (145 kg)
	Carried by 4 personnel
No. in set	4 (erection)

Rubber Bumper

Weight	86 lb (39 kg)
	Carried by 1 person
No. in set	3 (erection)
	2 (link)
	11 (bridge)

Short Ramp

Length	10 ft 1/2 in (3.06 m) overall
	10 ft (3.05 m) effective
Width	1 ft 10 in (0.56 m) overall
Height	9-1/4 in (0.24 m)
Weight	264 lb (120 kg)
	Carried by 4 personnel
No. in set	29 (bridge)

Short Reinforcing Link

Length	6 ft 3-1/2 in (1.92 m)
Width	1 ft 2-1/16 in (0.36 m)
Depth	3-15/16 in (0.10 m)
Weight	77.5 lb (35 kg)
	Carried by 2 personnel
No. in set	4 (link)

Strap, 5,000 lb

Length	21 ft 8 in (6.60 m)
Weight	4 lb (1.81 kg)
	Carried by 1 person
No. in set	44 (bridge)
	8 (link)
	12 (erection)

Strap 10,000 lb

Length	23 ft (7.01 m)
Weight	6 lb (2.72 kg)
	Carried by 1 person
No. in set	99 (bridge)
	18 (link)
	27 (erection)

Sway Brace

Length	10 ft 1-3/4 in (3.09 m)
Diameter	3-3/8 in (8.57 cm)
Weight	36 lb (16 kg)
	Carried by 1 person
No. in set	19 (bridge)

Tie-Down Lug

Length	7-1/4 in (0.18 m)
Width	4 in (0.91 m)
Weight	2 lb (1 kg)
	Carried by 1 person
No. in set	48 (bridge)
	8 (link)
	16 (erection)

Top Panel (TP)

Length	6 ft 4 in (1.93 m) overall
	6 ft (1.83 m) effective
Width	2 ft 1-1/2 in (0.65 m) overall
Height	1 ft 9-5/8 in (0.55 m)
Weight	385 lb (175 kg)
	Carried by 4 personnel
No. in set	34 (bridge)

Section III. PRINCIPLES OF OPERATION

1-11. INTERFACE OF MGB COMPONENTS

This section describes how the major MGB components work and interface with each other. The use individual components varies, depending on the type and length of bridge being assembled.

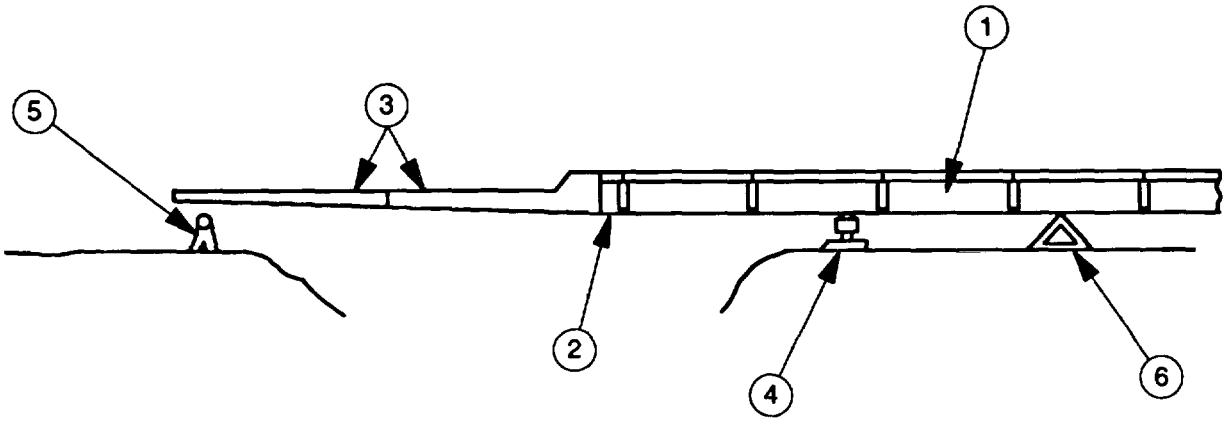


FIGURE 1-5. Launching Single Story Bridges up to 50ft (15.2m)

(1) TOP PANEL. Forms the main girders of the bridge. Top panels are connected to each other and other panels by shootbolts and panel pins, using a guide system to align the panels to enable the panel pins to be inserted.

(2) BANKSEAT BEAM. Provides the spading between bridge girders and can support MGB's maximum load when bearing its length. Bankseat beam connects to top panels or end taper panels.

(3) LIGHT LAUNCHING NOSE, FRONT AND REAR. Used a complete launching nose for 4 thru 8 bay single story bridges and as the forward section of the launching nose on all other bridges. They connect to each other using a launching nose pin. The rear light launching nose connects to the bankseat beam or the launching nose heavy.

(4) ROLLER BEAM ON FIXED SUPPORT AND BASEPLATE. Allows the bridge to be boomed (moved) during assembly or disassembly, using rollers which can be locked. Ground conditions determine whether the roller beam is placed on fixed supports and baseplates during launch of single story bridges.

(5) LANDING ROLLER. Used on far bank to receive the launching nose. Can be used on ground for 4 thru 8 bay single story, or on landing roller pedestal for longer bridges.

(6) BUILDING PEDESTAL. Used under girders to keep bridge off ground during construction of all single story bridges.

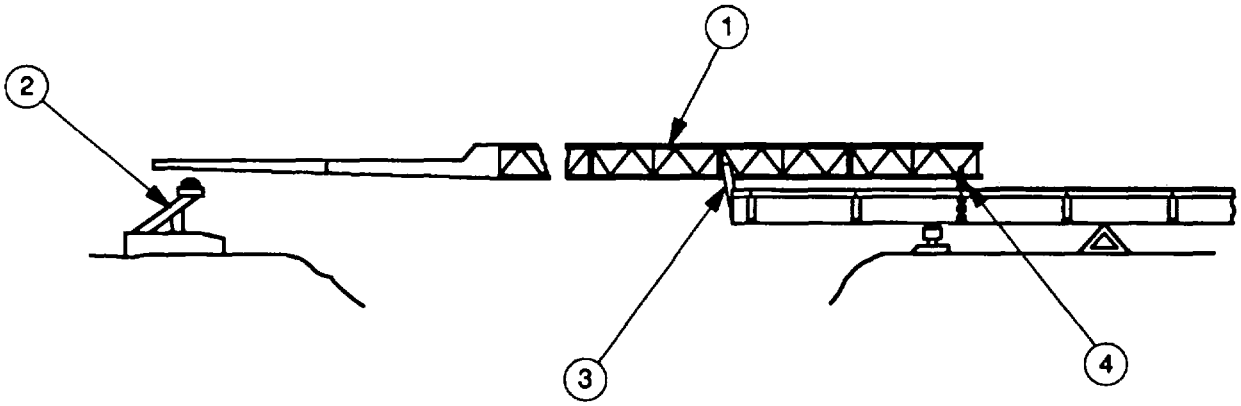


FIGURE 1-6. Launching Single Story Bridges Over 50ft (15.2m)

(1) LAUNCHING NOSE HEAVY. Forms the main pa of the launching nose on single story bridges over 8 bays and all other bridges. Launching nose heavies conned to each other by shoot bolts and launching nose pins, using a guide system to align the panels to enable the launching nose pins to be instead.

(2) LANDING ROLLER PEDESTAL. Holds the landing roller and receives the launching nose on the far bank. The Mk 1 landing roller pedestal s used in 9 thru 12 bay single story and 1 thru 22 bay doubles to bridges. The Mk 2 is used on all link reinforced bridges. The height of the landing roller pedestal is adjusted with a hydraulic jack, 15T for Mk 1 and 20T for Mk 2.

(3) LAUNCHING NOSE ROLLER. Permits movement of launching nose dung assembly/disassembly. Proves support and anchorage pint for launching nose. Connects to bankseat beam with launching nose pin.

(4) LAUNCHING NOSE CROSS GIRDER AND POSTS. Used to hold near bank end o launching nose in position set for construction and launch.

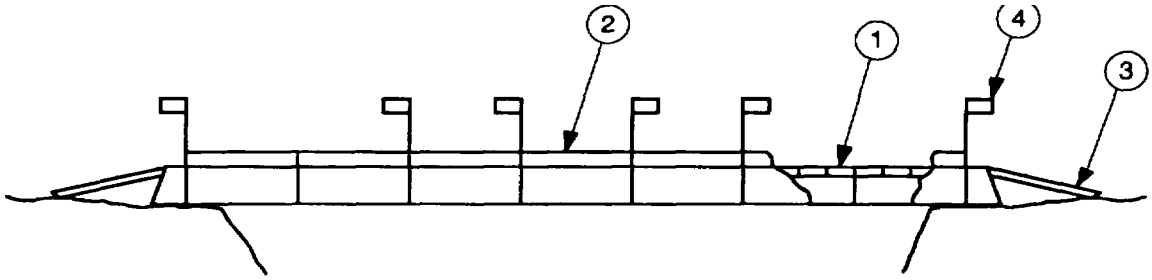


FIGURE 1-7. Single Story Bridge in Place

(1) DECK UNIT Placed between the main girders to complete the bridge roadway.

(2) CURB. Used to warn drivers o their nearness to the edge of bridge. A curb is used on each top panel.

(3) SHORT RAM Used at both ends of bridge allowing vehicles easy access. Short ramps are used on single story bridges only and are hooked onto the bankseat beam.

(4) BRIDGE MARKER GUIDE. Placed at the end of curbs to improve the drive awareness of the edge of the bridge.

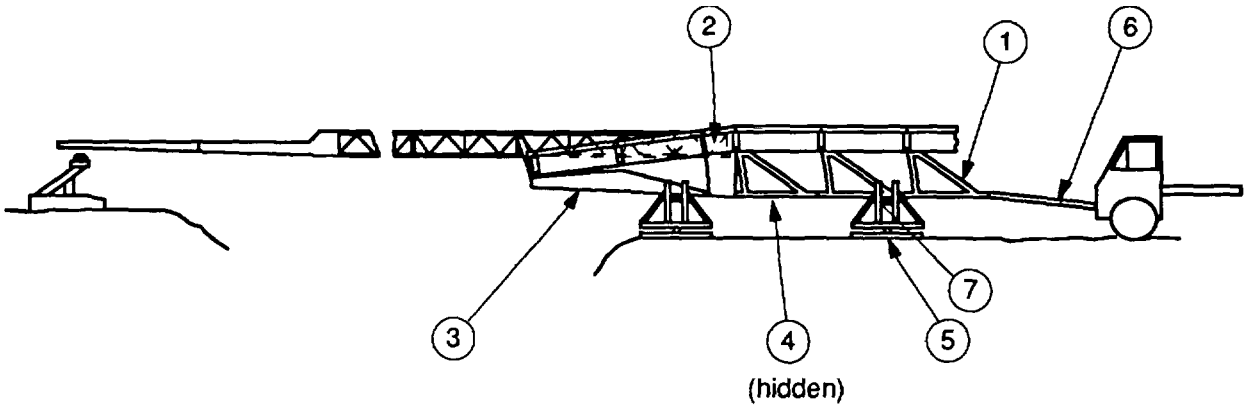


FIGURE 1-8. Launching Double Story Bridges up to 102ft (31.1m)

(1) BOTTOM PANEL. Forms a second, deeper girder that is used on double story and link reinforced MGB. Bottom panels connect to top panels and junction panels by shootbolts and panel pins, using a guide system to align the panels to enable the panel pins to be inserted.

(2) JUNCTION PANEL. Used in double story bridges to connect the sloping end of bridge o the level roadway of bridge.

(3) END TAPER PANEL. Forms a brace between the unction panel and bankseat beam. It provides most of the bearing surface needed for support of the bridge.

(4) SWAY BRACE. Used as a cross member between bottom panels in girders of double story bridges.

(5) FRONT AND REAR ROLLER BEAM ASSEMBLY. Always the bridge to be boomed (moved) during assembly or disassembly using rollers, which can be locked. The roller beam is placed on adjustable supports and baseplates which are connected by a frame cross girder. The beam can be raised or lowered using jacks.

(6) PUSH BAR, PUSH BAR ADAPTER AND PUSH BAR CROSS GIRDER. Used when a vehicle is needed to move the bridge. The push bar cross girder is used to connect the push bar to an unfinished bridge. The push bar adapter connects the push bar to the bumper of the truck. Long or shod push bars can be used, depending on the length and type of bridge.

(7) HYDRAULIC JACK. The 15 ton jack is used in the adjustable supports and the landing roller pedestal Mk 1. The 20 ton jack is used in the landing roller pedestal Mk 2. Jacks a also used with a jack support connected to the bankseat beam to raise and lower all types of MGB.

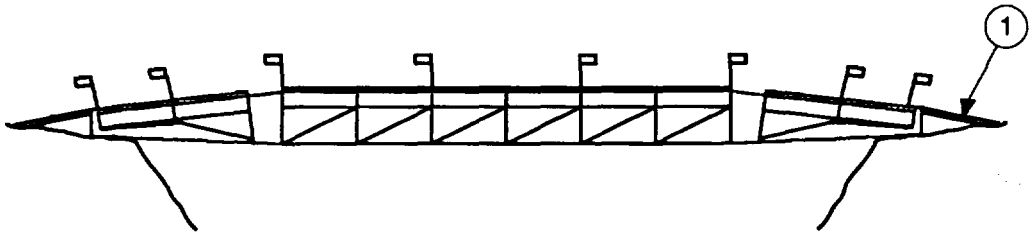


Figure 1-9. Double Story Bridge in Place

(1) LONG RAMP Used at both ends of bridge allowing vehicles easy access. Long ramps are used on all double story and link reinforced bridges and are hooked onto the bankseat beam.

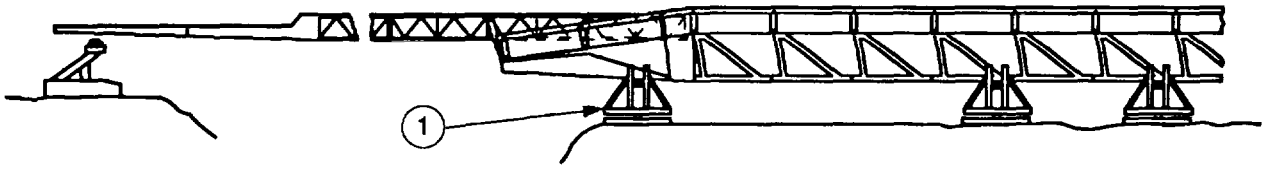


FIGURE 1-10. Launching Bridges over 102ft (31.1m)

(1) CAPSILL ROLLER BEAM ASSEMBLY. Used with the front and rear roller beam to allow the bridge to be boomed (moved) during assembly or disassembly. The capsill roller beam has rocking rollers and is placed on adjustable supports and baseplates which are connected by a frame cross girder. The beam can be raised or lowered using jacks and is used on all bridges over 12 bays long.

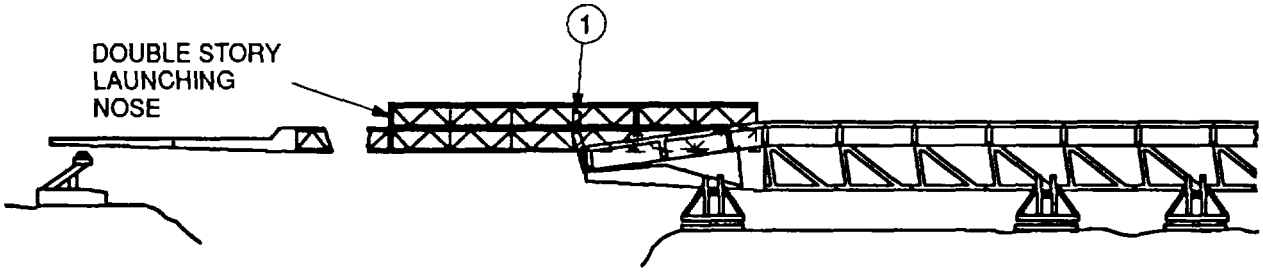


FIGURE 1-11. Launching Bridges from 144ft (43.9m) to 162 (49m)

(1) LAUNCHING NOSE LINK. Connects the second stow launching nose to the first story launching nose and the lunching nose roller.

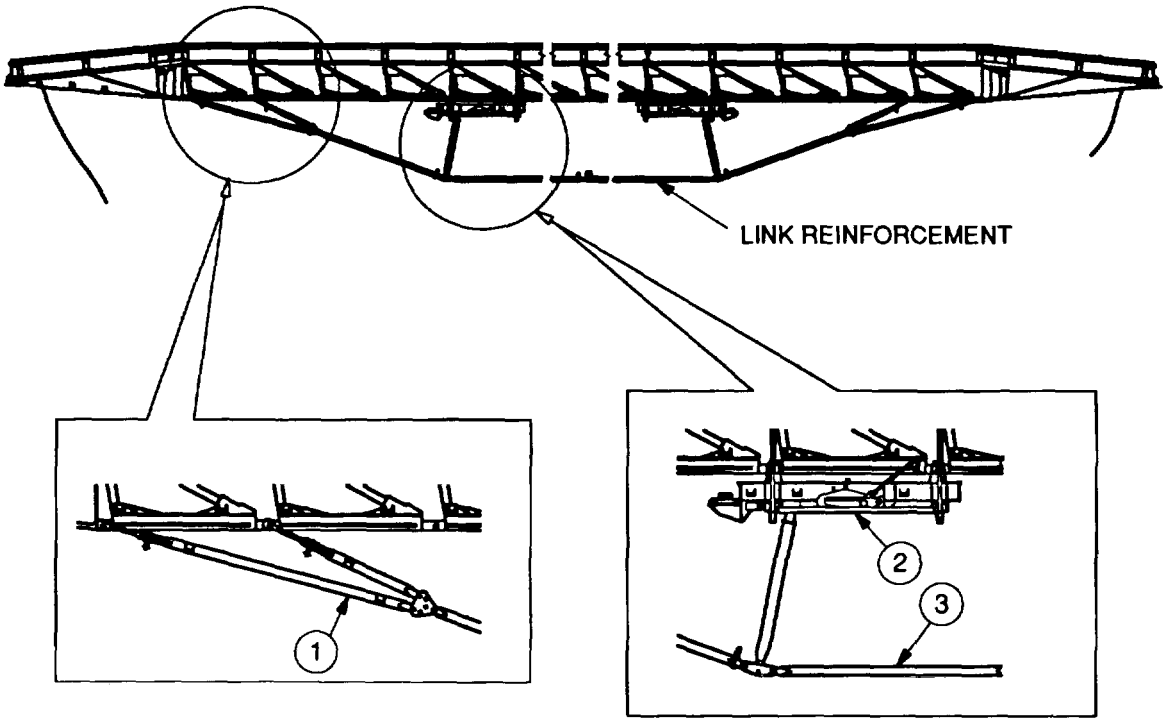


FIGURE 1-12. Link Reinforced MGB in Place

(1) ANCHOR ASSEMBLY Anchors the chain links to two of the bottom panel pins at each end o the bridge.

(2) POSTTENSIONING ASSEMBLY Used to remove slack from the complete reinforcement system. When the reinforcing post is correctly positioned, nearly vertical, the entire system tensioned and the bridge reinforced. A cable puller is used to position the tensioning post.

(3) REINFORCING LINK, LONG AND SHORT. Used to reinforce double story bridges. If a bridge has an odd number of bays, one short reinforcing link is used under the same bay on each chain. Links are connected with launching nose pins and have a guide system built into them.

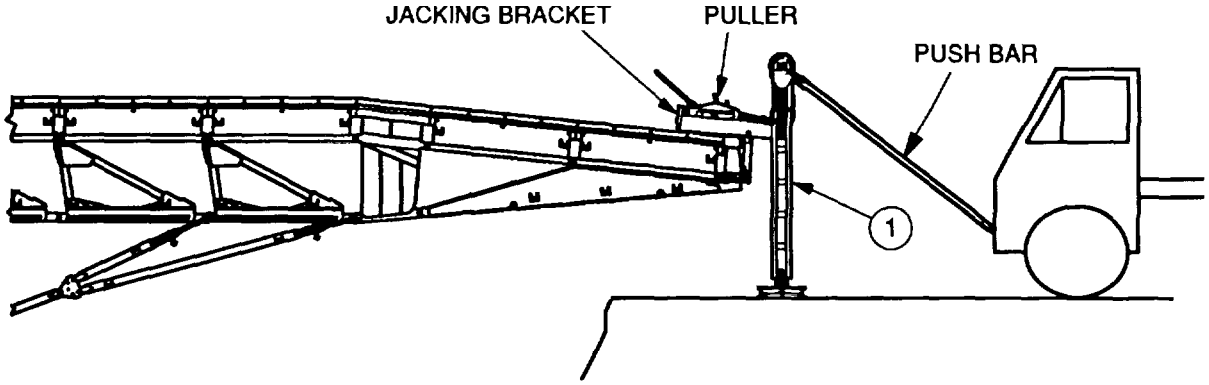


FIGURE 1-13. Lowering End of Bridge using Davits

(1) DAVIT ASSEMBLY. Used with jacking brackets, pullers, double story baseplates and push barn as an alternative to jacks or crane to raise or lower double story and link reinforced MGB.

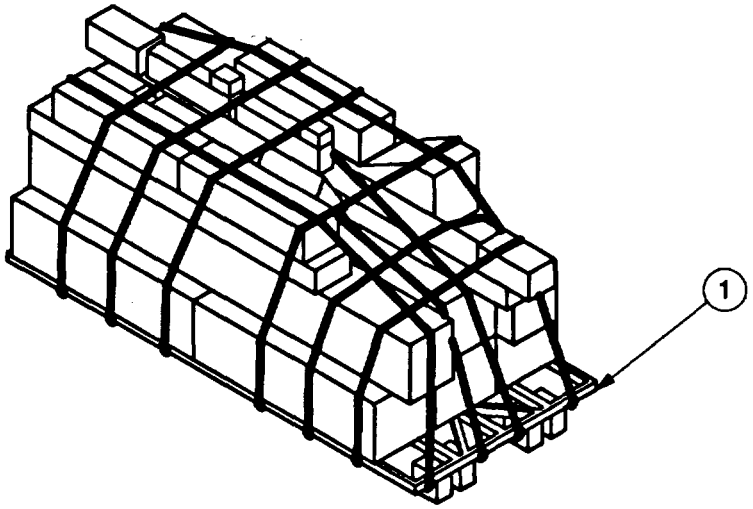


FIGURE 1-14. MGB Components on Pallet for Transportation

(1) PALLET Used t hold all MGB components for crane loading of trucks and trailers. Components a secured by straps connected to the pallet shackles. Rubber buffer at the front and rear buffer assembly absorb the shock of the pallet when hits the ground during off-loading.

CHAPTER 2

OPERATING INSTRUCTIONS

Page

Section I. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) 2-1
2-1 INTRODUCTION 2-1
2-2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES 2-1
Section II. OPERATION UNDER USUAL CONDITIONS 2-3
Section III. OPERATION UNDER UNUSUAL CONDITIONS 2-4
2-3 LAUNCHING IN HIGH WINDS 2-4
2-4 LAUNCHING UP STEEP SLOPES 2-6

Section I. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-1. INTRODUCTION

To ensure that the Medium Girder Bridge (MGB) set, the erection set and the link reinforcement set (LRS) are ready for operation at all times, they must be inspected systematically so that the defects may be discovered and corrected before they result in serious damage or failure.

a. Defects discovered during operation of the unit shall be noted and rectified, as soon as an operation has ceased. Sop operation that would damage equipment operation were to continue.

b. All deficiencies and shortcomings shall be reported together with corrective action taken on DA Form 2404, Equipment Inspection and Maintenance Worksheet, at the earliest opportunity.

c. If equipment fails to operate, trouble shoot with proper equipment (see Chapter 8f this manual. Report deficiencies using the proper forms; see DA Pamphlet 738750.

2-2. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

a. The preventive maintenance checks and services for MGB erected, in position and in combat use, are shown in Table 2-1.

NOTE

If equipment must be kept In continuous operation, check and service only those items hat can be checked and serviced without disturbing operation. Make complete checks and serves when equipment can be closed to traffic.

If any component shows obvious signs of damage, refer to Unit PMCS In TM 5-5420-212-23. In the table below items 2 through 9 "Equipment not ready/available" refers to the component, not the bridge.

TABLE 2-1. Preventive Maintenance Checks and Services Daily Schedule (visual) - Bridge Assembled.

ITEM No	ITEM TO BE INSPECTED	PROCEDURES
1	Bridge	a. Inspect approaches and exits for excessive wear. Ensure marker lights are visible and secure. b. Check condition of ground bearing/packing for damage or erosion at near bank and far bank. c. Check anchorages are secure. d. Check bridge position has not shifted. e. Equipment not ready/available approaches and exits have excessive wear and are not easy marked, ground bearing/packing and anchorages are insecure, or bridge has shifted excessively.
2	Bridge Marker Guide	a. Check marker guide is in position and secure. b. Check for obvious damage.
3	Curb	a. Check curb is in position and secure.
4	Deck Unit	a. Check for obvious damage, cracks or indentations. b. Check tread pattern is not excessively worn. c. Check deck units are in place and secure. d. Equipment not read/available if deck unit is not securely in place or is cracked or broken.
5	Ramp Unit	a. Check for obvious damage, cracks or indentations. b. Check tread pattern is not excessively worn. c. Check ramp units are in place and secure. d. Equipment not read/available if ramp unit is not securely in place or cracked or broken.
6	Top Panel	a. Check for obvious damage, cracks or indentations. b. Check tread pattern is not excessively worn. c. Equipment not ready/available if top panels show signs of obvious damage.
7	Junction Panel	a. Check for obvious damage, cracks or indentations. b. Check tread pattern is not excessively worn. c. Equipment not ready/available f junction panels show signs of obvious damage.
8	End Taper Panel Bankseat Beam Sway Brace Bottom Panel Anchor Assembly Post Tensioning Assy Reinforcing Links	a. Check for obvious damage, cracks or indentations. b. Equipment not ready/available f components show signs of obvious damage.
9	Pins and Retainer Clips	a. Where pins and clips are visible, check they are in place and have not vibrated loose. b. Equipment not ready/available pins or clips are not in place.

b. The preventive maintenance checks and services for a bridge used in engineer training with frequent assembly, trafficking an disassembly, are shown in Table 2-2. The components must be disassembled from the bridge and removed from pallets.

TABLE 2-2. Preventive Maintenance Checks and Services Monthly Schedule (visual) - Bridge Disassembled.

NOTE
If any component shows obvious signs damage refer to Unit PMCS in TM 5-5420-212-23.

ITEM No	ITEM TO BE INSPECTED	PROCEDURES
	All	These inspections should look for evidence of the following: a. Damage to the protective paint and zinc coatings. b. Impact damage c. Signs of corrosion d. Resilient mounts are intact e. Correct operation of all shot bolts f. Check all welds for cracks especially indicator jaw No. 6. g. Security of carrying bar brackets h. Security of sway brace brackets i. All rollers free and not seized j. Damage to guide slots, dowels and pin holes k. Security of captive pins I. Cracking around jacking points m. Carrying tools intact and safe to use n. Equipment not ready/available if items above do not pass inspection

Section II. OPERATION UNDER USUAL CONDITIONS

An MGB mission is a multi-activity operation broken down into the following phases. Most o the activity is concurrent. For example during the assembly a double story bridge, after lowering the are bank end of bridge, the far bank crew are able to remove the launching nose while the near bank crew are lowering the near bank end of bridge. The purpose of this manual is to detail these procedures, therefore, to avoid confusion, concurrent activity is not addressed. The NCOIC will determine who performs these procedures and at what time.

The bridging operation will begin with preliminary planning with includes preliminary studies, se selection, reconnaissance, design, estimation of manpower and times. This is covered in Chapter 3. Then follows the six phases of the operation. Phases a, b, e and f (below) are covered in Chapter 3 and phases c and d in Chapter 4, 5, 6 and 7.

a. Pallet Off-Loading: After the marking the se has been completed, the pallets a removed from trucks and trailers. Pallets may be pulled of trucks and trailers with the aid of an extractor cable, or trucks may dump pallets by raising the bed.

b. Pallet Unpacking: Unpacking consists unstrapping pallets and carrying bridge parts to the assembly site.

c. Assembly: The assembly begins with the construction of the roller beam and ends when the bridge is open to traffic.

d. Disassembly: The disassembly begins with the removal of the guide markers and ends when cleaning of the bridge and erection parts is finished.

e. Pallet Repacking: consists of carrying the bridge and erection parts from the disassembly site to the loading site and placing and strapping the parts on their assigned pallets.

f. Pallet Reloading: Reloading consists of lifting the pallets onto the trucks and trailer.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

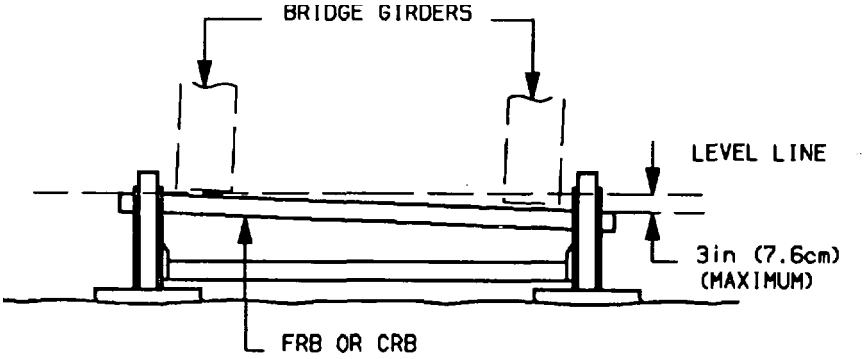
This section deals with adverse conditions under which the bridge may have to be launched and the methods of controlling the launch.

2-3. LAUNCHING IN HIGH WINDS

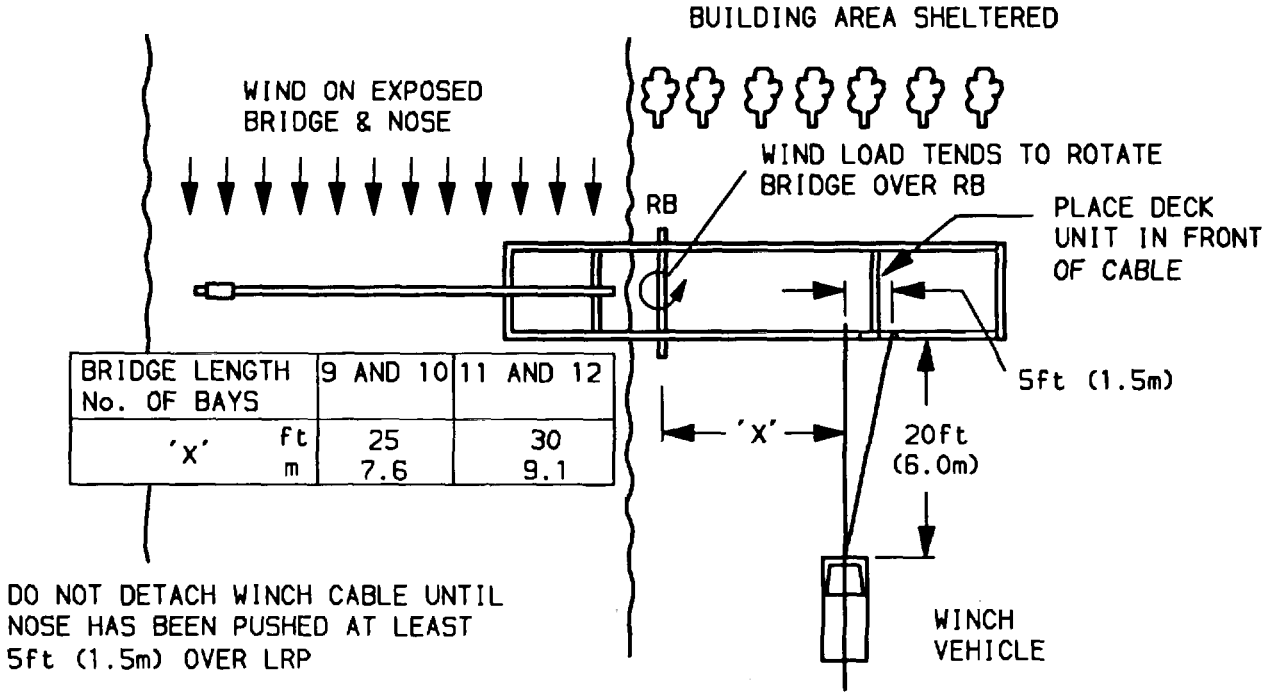
a. When launching with e building area sheltered and the gap exposed, wind loads may cause the bridge to rotate about the forward roller beam or capsill roller beam, until the bridge is jacked down onto the far bank. Bridges shall not be launched in more severe conditions than those given below.

TABLE 2-3. Launching conditions

BRIDGE LENGTH	Single Story (SS) Double story (DS) Link Reinforced (LR)	MAXIMUM CONDITION DURING LAUNCH	
		WIND SPEED	CROSS FALL ON BRIDGE
4 thru 12 Bay	SS	40mph (65km/ph)	1 in 20*
2E + 1 thru 2E + 12	DS	40mph (65kmph)	1 in 20*
2E + 13 thru 2E + 16	LR	40mph (65km/ph)	no cross fall*
2E + 17 thru 2E + 22	LR	30mph (48km/ph)	no cross fall*
RRB/FRB/CRB shall be approximately [within 3in (7.6 cm)] level when the launching nose has touched the far bank. See sketch below.			

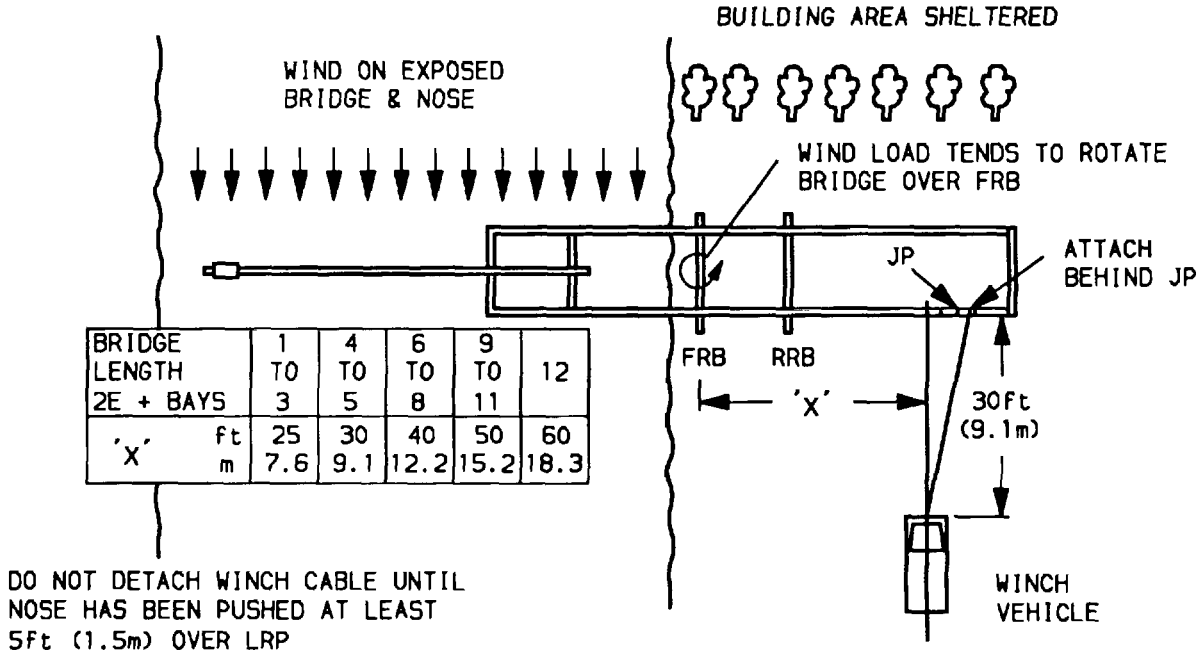


b. When launching bridges in winds over 30 mph (48 km/h), is necessary t attach a vehicle with able at right angles to the bridge, as shown in the following three sketches.



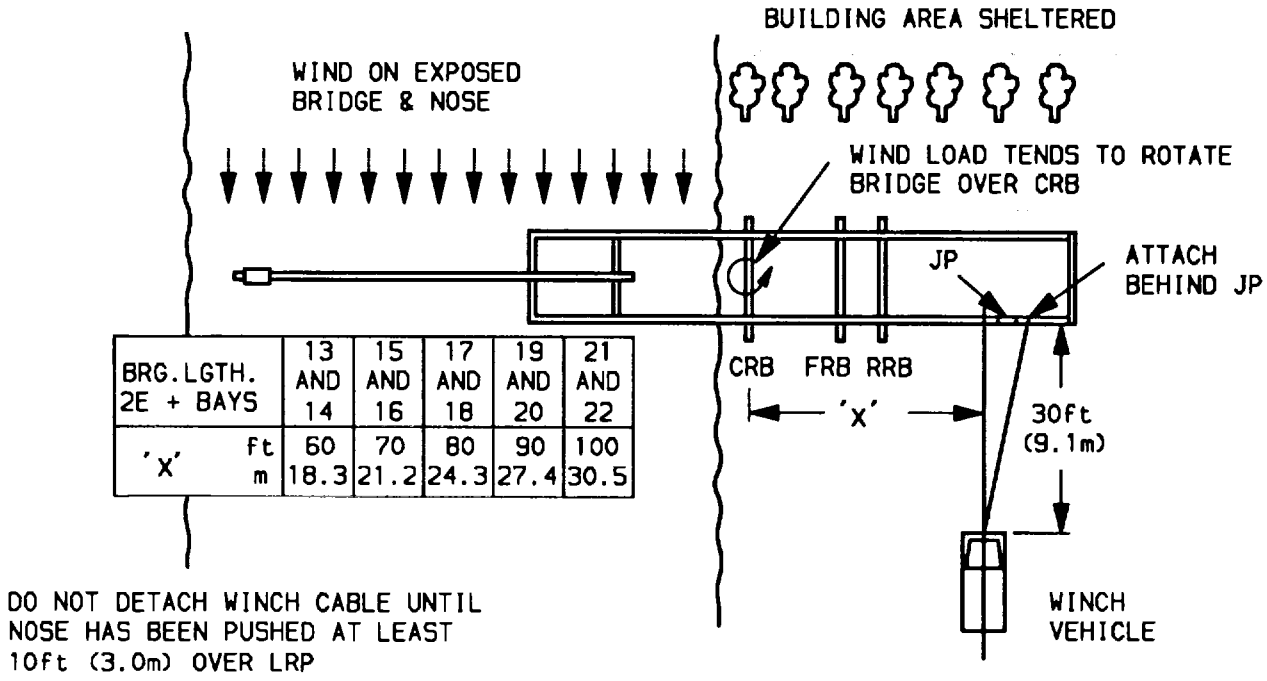
BRIDGE LENGTH No. OF BAYS		9 AND 10	11 AND 12
'X'	ft	25	30
	m	7.6	9.1

SINGLE STORY BRIDGE



BRIDGE LENGTH 2E + BAYS		1 TO 3	4 TO 5	6 TO 8	9 TO 11	12
'X'	ft	25	30	40	50	60
	m	7.6	9.1	12.2	15.2	18.3

DOUBLE STORY BRIDGE


BUILDING AREA SHELTERED
WIND ON EXPOSED BRIDGE & NOSE
WIND LOAD TENDS TO ROTATE BRIDGE OVER CRB
JP
ATTACH BEHIND JP
CRB FRB RRB
'X'
30ft (9.1m)
WINCH VEHICLE
DO NOT DETACH WINCH CABLE UNTIL NOSE HAS BEEN PUSHED AT LEAST 10ft (3.0m) OVER LRP

BRG. LGTH. 2E + BAYS	13 AND 14	15 AND 16	17 AND 18	19 AND 20	21 AND 22
'X' Ft	60	70	80	90	100
'X' m	18.3	21.2	24.3	27.4	30.5

LINK REINFORCED BRIDGE

c. The winch cable is used to prevent the tail of the bridge from moving sideways dung launch. By taking in cable as the tail approaches the vehicle and paying it out as it moves away, the bridge is held over the center-line.

d. The winch cab is not detached from the tail of the bridge until a least 5 ft (1.5 m) (single story) or 10 ft (3.0 m) (double story and link reinforced) of the launching nose has passed the landing roller pedestal

e. During the lunching, the far bank crew should steady the nose on the launching roller pedestal until at least 20 ft (6.0 m) of the launching nose has passed he landing roller pedestal.

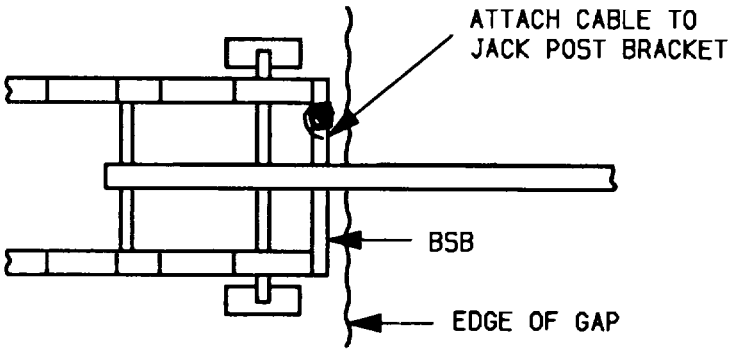
2-4. LAUNCHING UP STEEP SLOPES

a. When launching up s8pes of 1 in 30 to I in 10 (single story) or 1 in 30 to 1 in 20 (double story and link reinforced), may become necessary the complete the s launch with the aid of a hauling cable. It will also be necessary to use a vehicle and a push bar during launch.

b. The following procedure describes a method of launching a bridge up a steep slope.

(1) Before booming, attach cable to jackpost bracket on far bank bankseat beam, on near bank.

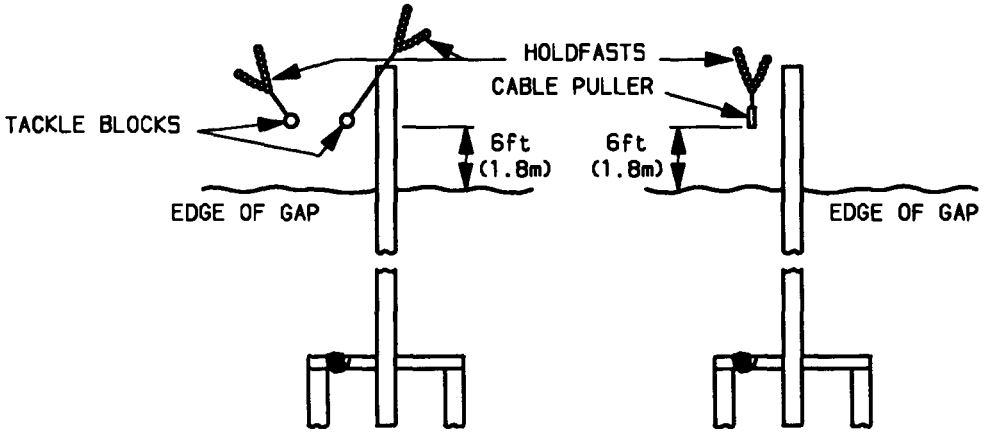
(2) Loop remaining sack of cable and place on nose unit.



(3) Begin booming bridge with the aid of a vehicle and push bar.

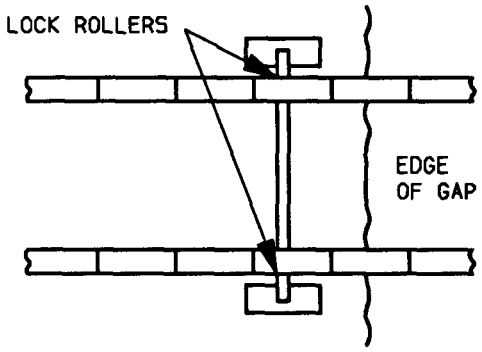
(4) After nose touches down on far bank, carry two holdfasts and two block and tackle units over to far bank if vehicle is to be used. If cable puller is to be used, only one holdfast is needed.

(5) To one side of bridge centerline, attach block and tackle units or cable pullers to holdfasts. Units should be placed a minimum of 6 ft (1.8 m) from edge of bank.



(6) Place nose unit on landing roller pedestal.

(7) Lock RRB/FRB rollers (single and double story) or CRB rollers (link reinforced).



(8) Put cable through block and tackle units (for vehicle assisted launch), or into cable puller.

(9) Connect other end of cable to winch vehicle on home bank, or to a cable puller which is operated from far bank.

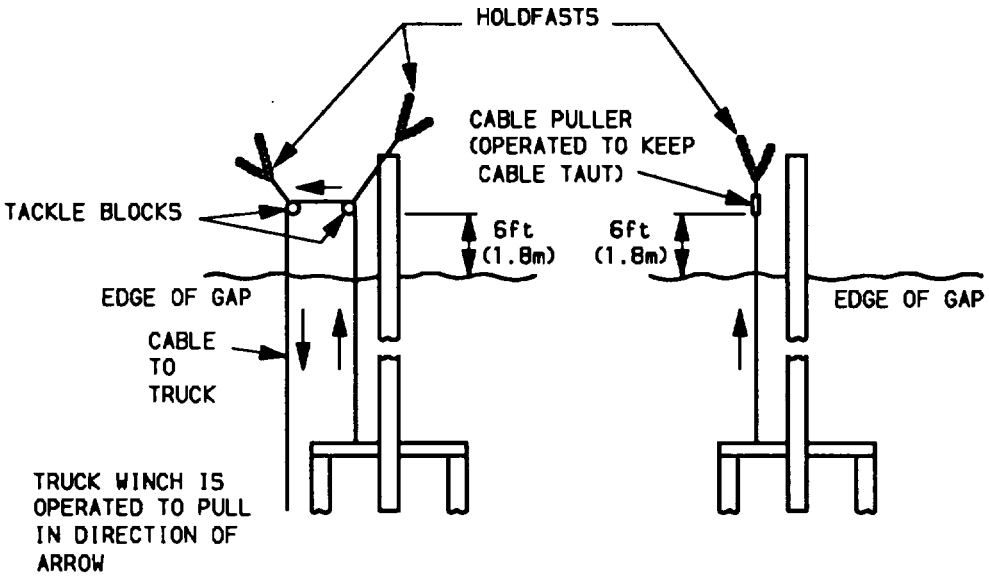
(10) Make sure vehicle and push bar are connected to last bay or end of bridge.

(11) Unlock RRBIFRB, or CRB rollers.

(12) Continue to boom in the following manner:

(a) At the same time and at the same speed as push bar vehicle pushes bridge forward, winch vehicle pulls in the opposite direction.

(b) Cable puller is operated to keep cable taut.



(13) After each part of launch, make sure RRB/FRB or CRB rollers are locked before detaching push bar from end of bridge.

(14) Disconnect cable from bankseat beam after far bank end of bridge has been lowered to ground.

CHAPTER 3
PREPARATION FOR USE

Section I.	INTRODUCTION	3-2
Section II.	SERVICE ON RECEIPT	3-2
3-1	INTRODUCTION	3-2
3-2	SERVICE ON RECEIPT	3-2
Section III.	PRELIMINARY PLANNING	3-2
3-3	SAFE WORKING LOADS	3-2
3-4	PRELIMINARY STUDIES	3-8
3-5	SITE SELECTION	3-8
3-6	RECONNAISSANCE REPORT	3-14
3-7	CHOICE OF BRIDGE LENGTH AND CLASS	3-14
3-8	BRIDGE CONSTRUCTION TIMES	3-15
3-9	WORK PARTY REQUIRED	3-16
Section IV.	Design	3-16
3-10	DESIGN PHASE 1	3-16
3-11	DESIGN PHASE 2	3-18
3-12	SINGLE STORY 4 THRU.12 BAY DESIGN	3-18
3-13	SINGLE STORY 9 THRU 12 BAY DESIGN ON RESTRICTED SITES	3-26
3-14	DOUBLE STORY 2E + 1 THRU 2E + 12 BAY DESIGN	3-26
3-15	DOUBLE STORY 2E + 1 THRU 2E + 12 BAY DESIGN ON RESTRICTED SITES	3-34
3-16	DOUBLE STORY 2E + 13 THRU 2E + 22 BAY DESIGN w/o LRS	3-35
3-17	DOUBLE STORY 2E + 13 THRU 2E + 22 BAY DESIGN WITH LRS	3-42
Section V.	TRANSPORT AND PALLETIZATION	3-57
3-18	TRANSPORT REQUIREMENTS	3-57
3-19	PALLETIZATION - SINGLE STORY	3-57
3-20	PALLETIZATION - DOUBLE STORY	3-85
3-21	PALLETIZATION - LINK REINFORCEMENT	3-109
3-22	PALLETIZATION - SPARES PALLETS	3-122
3-23	LOADING PALLETS ON TRANSPORT VEHICLES	3-122
3-24	OFF-LOADING PALLETS FROM TRANSPORT VEHICLES	3-132

Section I. INTRODUCTION

This chapter provides the information needed to select the best site for the bridge, determine the length and class of the bridge, perform bridge design, and assemble/disassemble all Medium Girder Bridges (MGB) with and without reinforcement.

NOTE

To simplify the tables and text in this chapter, some areas are not dual dimensioned. To convert metric Into U.S. standards use the conversion chart on the Inside back cover of this manual.

Section II. SERVICE ON RECEIPT

3-1 INTRODUCTION

This section provides the information to unpack, inventory and inspect the components of bridge, erection sets and link reinforcement sets before everyday use.

3-2 SERVICE ON RECEIPT

a. Before unpacking, ensure that the containers are the right side up.

b. Unpack and inventory the components listed in supply catalogs SC 5420-97-CL-E52 and SC 5420-97-CL-E53 for bridge and erection sets, and SC 5420-97-CL-E56 for link reinforcement sets.

c. Inspection of all components will be performed in accordance with Table 2-2.

d. Check all components for any damage that may have occurred during shipping and ensure that they are in a serviceable condition. Send any defective item to Unit Maintenance.

Section III. PRELIMINARY PLANNING

3-3 SAFE WORKING LOADS

NOTE

Paragraphs a, b and Table 3-1 are not for normal operations or bridge design, but special information if MGB or its components are to be used In special circumstances.

a. General

This section gives the maximum permissible loads which may be applied to components when loaded as illustrated below. No allowance has been made for impact or self weight. The maximum loads given are in some cases lower than those used in the rest of the TM.

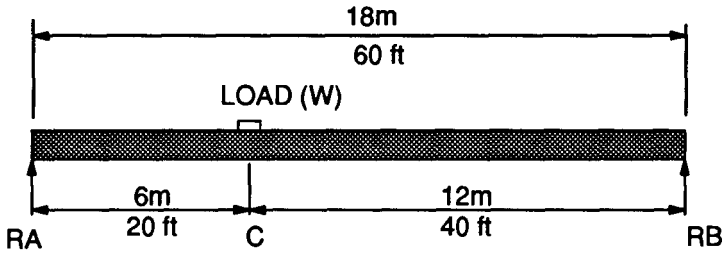
Loads must be evenly distributed over an area at least 200 mm (8 in) times the full width of components. It is advisable to use timber to distribute the load and to avoid slippage between metal to metal surfaces.

b. To find the maximum allowable load 'LOAD'

For girders (Table 3-1 items 1 to 6) the allowable load can be calculated from tabulated values of moment resistance and shear. The example below shows how to derive load for a single story girder.

EXAMPLE

SINGLE STORY GIRDER
DEAD WEIGHT = 0.91 kN/m (0.028 ton/ft)



(1) From Table 3-1 item 1:
Maximum allowable SHEAR for a single story girder is 189 kN. This occurs at RA.
Maximum allowable MOMENT for a single story girder is 677 kNm. This occurs at C.
Steps (2) and (3) below will find Wusing these two values, and the smallest calculated value for W will be the maximum allowable load.

(2) To find W using the SHEAR value:

The maximum shear (189 kN) occurs at RA:
Taking moments about RB

RA x 18= Wx 12 + (18x 0.91) x9

RA = 12/18W+ [(18 x 0.91) x 9]/18
RA = 2/3W + 8.19 from above RA = 189

Therefore: 2/3W+ 8.19 = 189

Therefore: W= 271 kN (27.24 tons f)

(3) To find W using the MOMENT value:

The maximum bending moment (677 kNm) occurs at C.

Taking moments about C:

RA x 6 - (0.91 x 6) x 3 = 677 from step (2) RA = 2/3W + 8.19

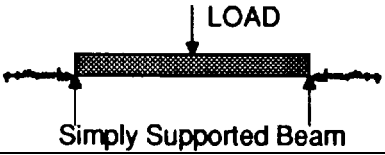
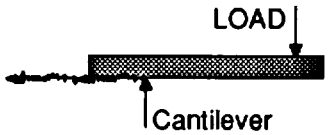
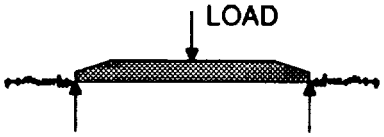
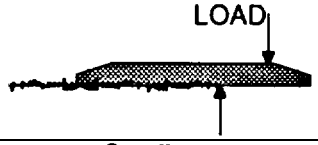
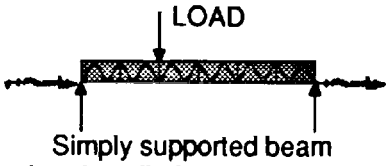
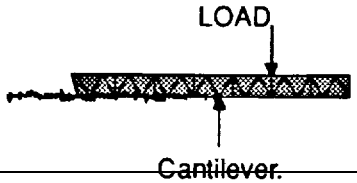
Therefore: (2/3W+ 8.19)x 6 - (0.91 x 6) x 3 = 677

4W + 49.14- 16.38 = 677

Therefore: <u>W= 161 kN (16 tons f)</u>

(4) Therefore the maximum load (W) that can be imposed on the single story girder in the position shown, and not exceed the maximum allowable shear (step 2) or the maximum bending moment (step 3), is <u>161 kN (16 tons f)</u>

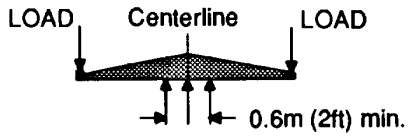
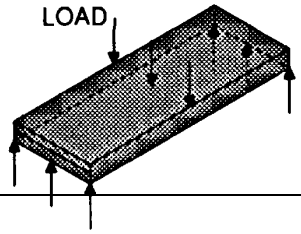
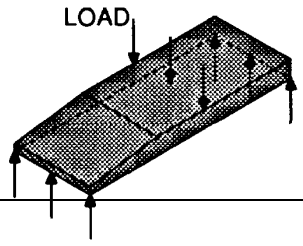
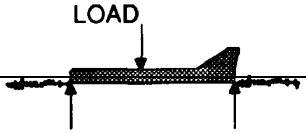
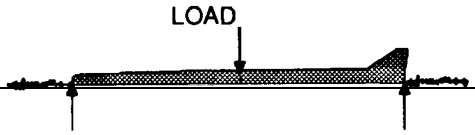
TABLE 3-1 Maximum loading for girders

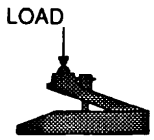
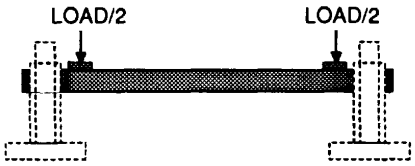
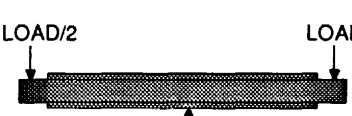
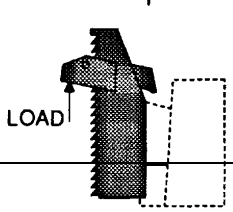
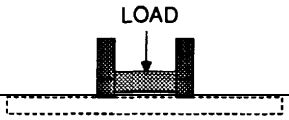
Item	Part	Maximum Loading	Moment of Resistance	Shear
1	Bridge, Single Story Single girder		677 kNm 223 ton ft	189 kN 19 ton
2	Bridge, Single Story Single girder		91 kNm 30 ton ft	189 kN 19 ton
3	Bridge, Double Story Single girder		2970 kNm 978 ton ft	388 kN 39 ton
4	Bridge, Double Story Single girder		896 kNm 295 ton ft	388 kN 39 ton
5	Launching Nose Heavy		522 kNm 172 ton ft	150 kN 15 ton
6	Launching Nose Heavy		222 kNm 73 ton ft	150 kN 15 ton

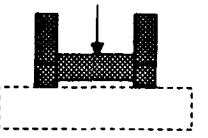
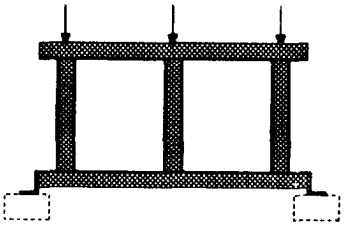
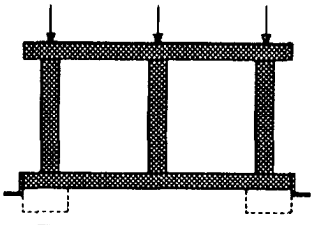
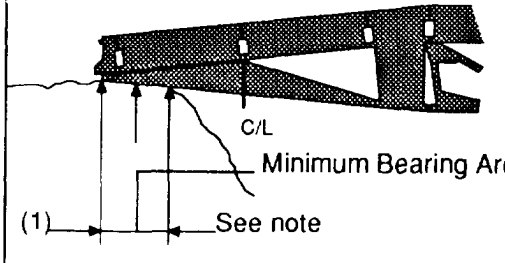
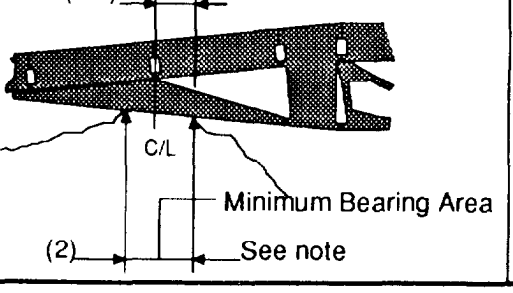
c. Maximum loading of bridge components

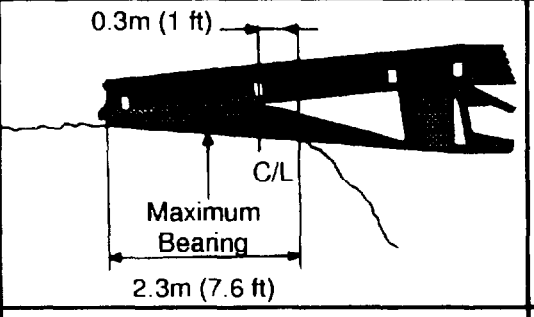
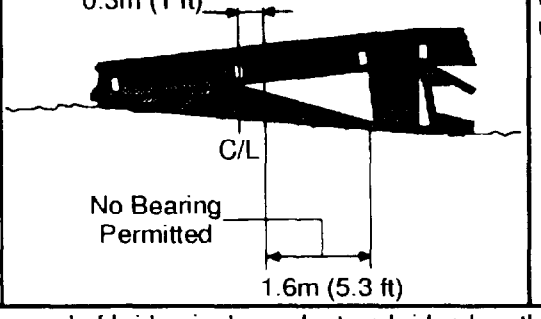
Table 3-2 explains the maximum load capacities of the major MGB components. The table shows the maximum load permitted and where the load is applied during bridge operation.

TABLE 3-2 Maximum loading for components

Item	Part	Maximum Loading	Description of load Application	Load
1	End Taper Panel		Load applied across full jaw position. Support to be uniformly distributed about and across full width of panel	200 kN 20 ton
2	Deck Unit		Load across full width anywhere on span	109 kN 11 ton
3	Ramp Unit		Load across full width anywhere on span	154 kN 15.5 ton
4	Sway Brace		Tension	85 kN 8.5 ton
			Compression	70 kN 7 ton
5	Launching Nose Light (Rear Section)		Load across full width anywhere on span	35 kN 3.5 ton
6	Launching Nose Light		Load across full width anywhere on span	12 kN 1.2 ton

Item	Part	Maximum Loading	Description of load Application	Load
7	Landing Roller and Landing Roller Pedestal		Vertical Load Load per Roller = LOAD/2	110 kN 11 ton (Mk 1) 131 kN 13.1 ton (Mk 2)
8	Roller Beam		Load on rollers	240 kN 24 ton
9	Roller Beam	Roller beam on adjustable supports Roller beam on fixed supports and single story baseplates.	Load on rollers	100 kN 10 ton
10	Push Bar		Tension or compression	65 kN 6.5 ton
11	Push Bar Cross Girder		Tension or compression from push bar or SWR	65 kN 6.5 ton
12	Jack Post		Vertical load from jack	65 kN 6.5 ton
13	Jack Support	 On buil seplate	Vertical load	100 kN 10 ton

Item	Part	Maximum Loading	Description of load Application	Load
14	Jack Support	LOAD  On RB support, baseplate, SS	Vertical load	45 kN 4.5 ton
15	Building Pedestal	LOAD 	Load across full width of pedestal	22 kN 2.2 ton
16	Building Pedestal	LOAD 	Load across full width of pedestal	101 kN 10.1 ton
17	End of Bridge (1)		Bridge must be supported by full width of panels. If necessary, timber or sand-bags may be used.	
	End of Bridge (2)	0.3m (1 ft) 	Minimum area across width of panels anywhere between the extremes at (1) and (2).	

Item	Part	Maximum Loading	Description of load Application	Load
18	End of Bridge (1)		Bridge must be supported by full width of panels. If necessary, timber or sandbags may be used.	
19	End of Bridge (2)		No bearing of any width permitted under this area.	
NOTE: Minimum bearing area for end of bridge is dependent on bridge length, refer to tables 3-9, 3-16, 3-25 and 3-32.				

3-4 PRELIMINARY STUDIES

A thorough evaluation of information from preliminary studies may aid the reconnaissance by limiting it to a few suitable sites. Sources of preliminary information are intelligence studies and reports, interviews with local civilians, maps, aerial photographs, and personal aerial reconnaissance.

3-5 SITE SELECTION

Whenever possible, aground reconnaissance is made to find a site that has selection factors desirable for construction of single story and double story MGBs, with and without reinforcement. Following are the factors that must be considered during the reconnaissance.

a. Access Routes

Access routes at each end of the bridge that tie in to the main road network. These routes should not require too much maintenance or preparation.

b. Approaches

(1) Single and Double Story MGB

Approaches requiring little preparation. Should be two lanes wide and straight for 160 ft (48.8 m) at each end of the bridge. Slope of the approach should not exceed 1 in 10. Transverse (side to side) slope should not exceed 1 in 10 (up to 5 bay SS) or 1 in 20 (all other bridges) in the first 60 ft (18.3 m) measured from the A' peg. See Figures 3-1, 3-2 and Chapter 1, Table 1-1.

(2) Link Reinforced MGB

Approaches requiring little preparation. Should be two lanes wide and straight for 160 ft (48.8 m) at each end of the bridge. Slope of the approach should not exceed 1 in 20. Transverse (side to side) slope should not exceed 1 in 20 in the first 60 ft (18.3 m) measured from the A' peg. See Figure 3-2.

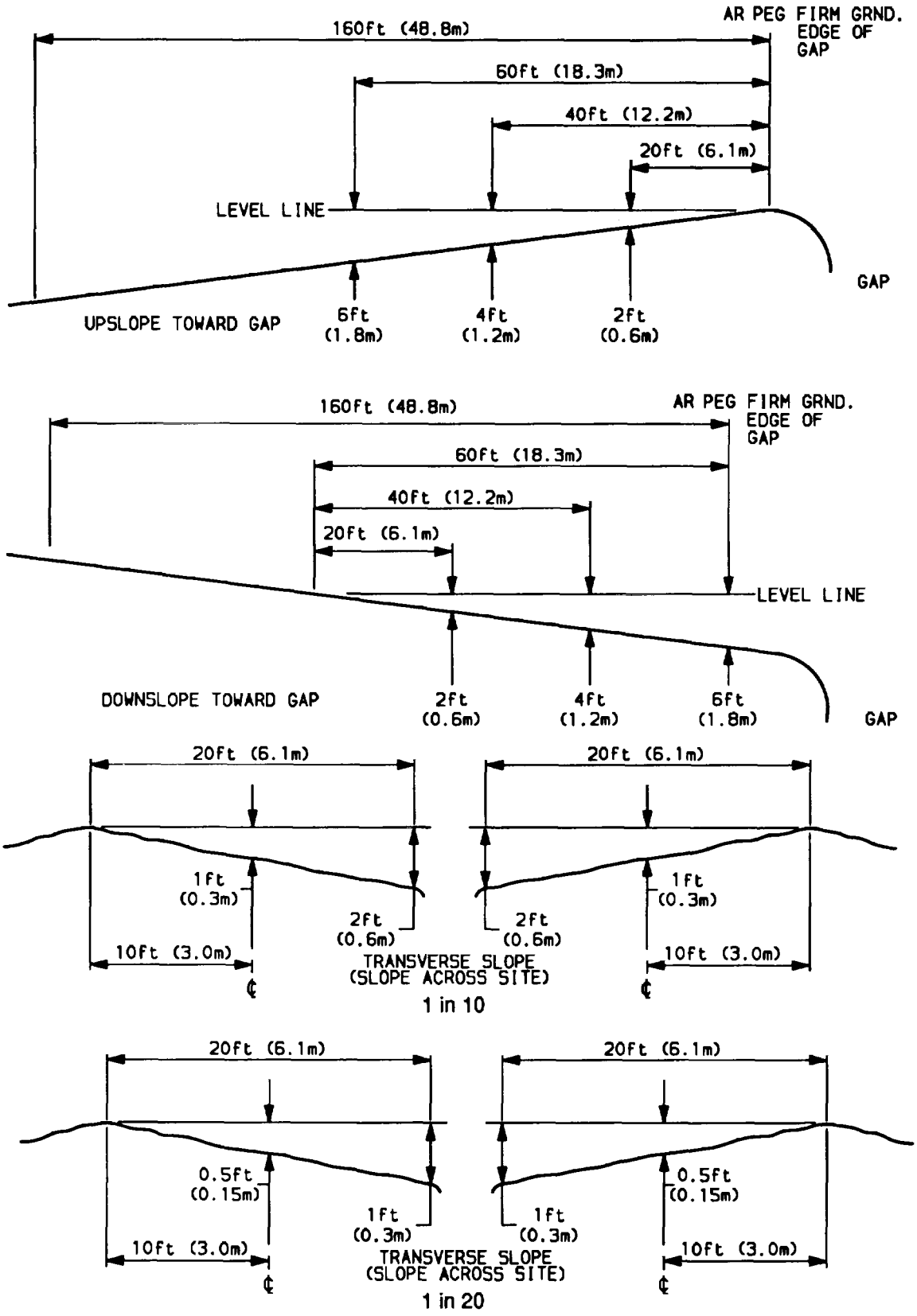


FIGURE 3-1. Approaches - single and double story

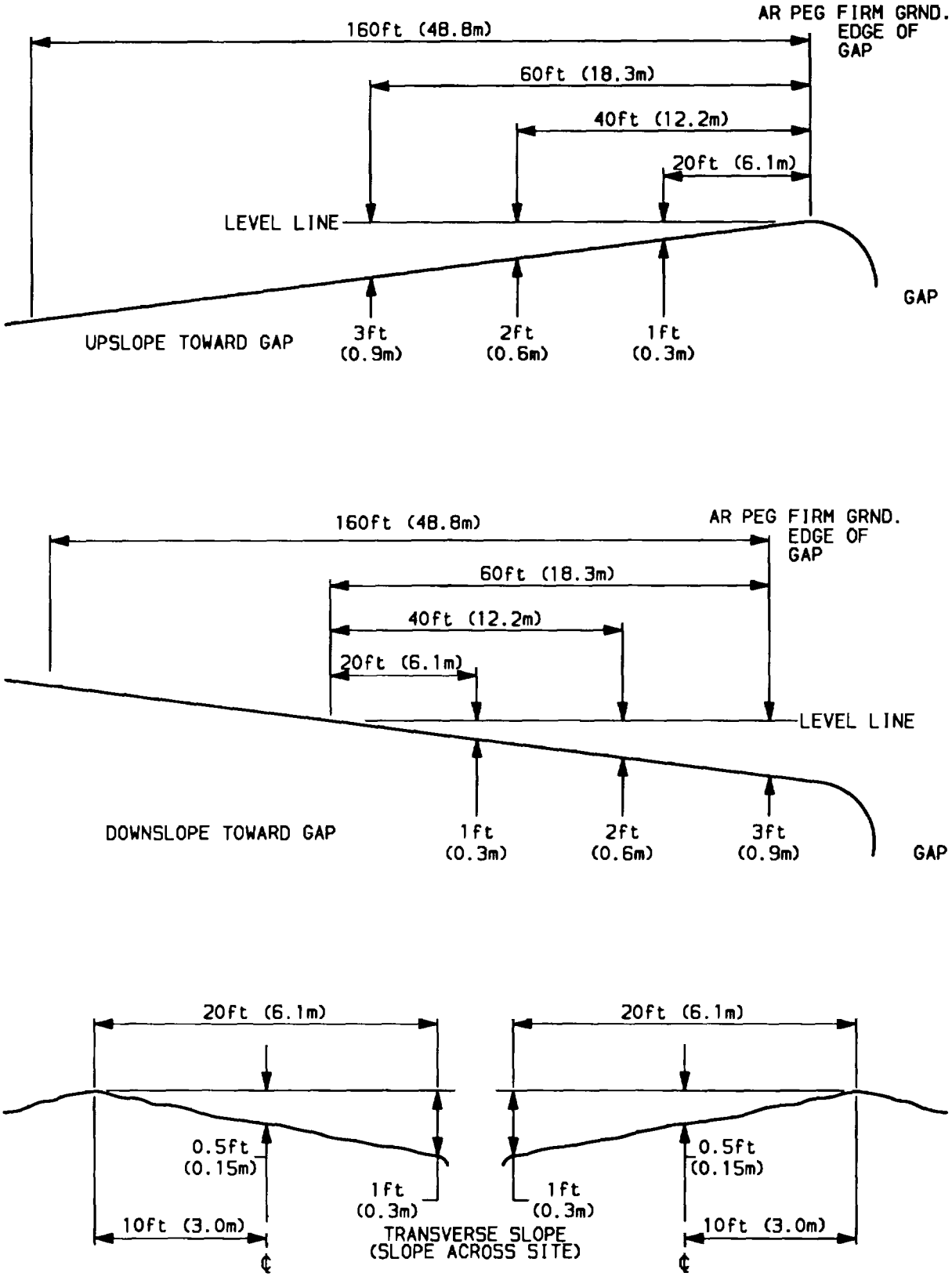


FIGURE 3-2. Approaches - link reinforced MGB

c. Banks

(1) Single and Double Story MGB

Firm and stable banks of about equal height. The difference in bank height cannot exceed 10% of the bridge length, as the bridge is restricted to a 1 in 10 slope.

(2) Link Reinforced MGB

Firm and stable banks of about equal height. The difference in bank height cannot exceed 5% of the bridge length, as the bridge is restricted to a 1 in 20 slope

(3) Banks at expected bearing points of bridge should have a Soil Bearing Capacity (SBC) of 2 tons per square foot. Table 3-3 lists SBC of various types of soil.

TABLE 3-3 Soil bearing capacity

Soil Description	Bearing values in tons per square foot
Hardpan overlaying rock	12
Very compact sandy gravel	10
Loose gravel and sandy gravel, compact sand and gravelly sand; very compact sand-inorganic silt soils	6
Hard dry consolidated clay	5
Loose course to medium sand, medium compact fine sand	4
Compact sand clay	3
Loose fine sand, medium compact sand-inorganic silt soils	2
Firm or stiff clay	1.5*
Loose saturated sand-clay soils, medium soft clay	1*

*Bridges constructed on this type of soil will require packing to cover a 3 ft (0.9 m) area under ETP to spread weight of bridge. Watch settling during crossing of traffic, and increase packing if needed. Packing material required is 3 in x 8 in x 36 in lumber, and the height of packing will be the minimum necessary to keep ETP's from touching bank.

d. Size of Construction Site

(1) Types of Sites

(a) Normal - provides construction space that allows fast and easy construction.

(b) Restricted - construction space is limited, and requires special construction procedures e.g. longer launching nose, counterweights and more frequent booming of the bridge.

(2) Assembly Site

Assembly site large enough for assembly of the bridge and wide enough for unloading and positioning of the loaded bridge pallets. The desired size of the assembly site for the longest single story bridge is 160 ft wide x 80 ft long (48.8 m x 24.4 m). The desired size for double story and link reinforced bridges is 160ft wide x 160 ft long (48.8 m x 48.8 m).

This length includes the R distance (maximum distance to the rear of the front or capsill roller beam, required for construction) and truck with push bar attached. The width allows for ample construction space and good spacing of pallets from centerline. If needed, this area can be reduced considerably by bringing in pallet loads one at a time or as needed. The desired size of a site is shown on Figure 3-3.

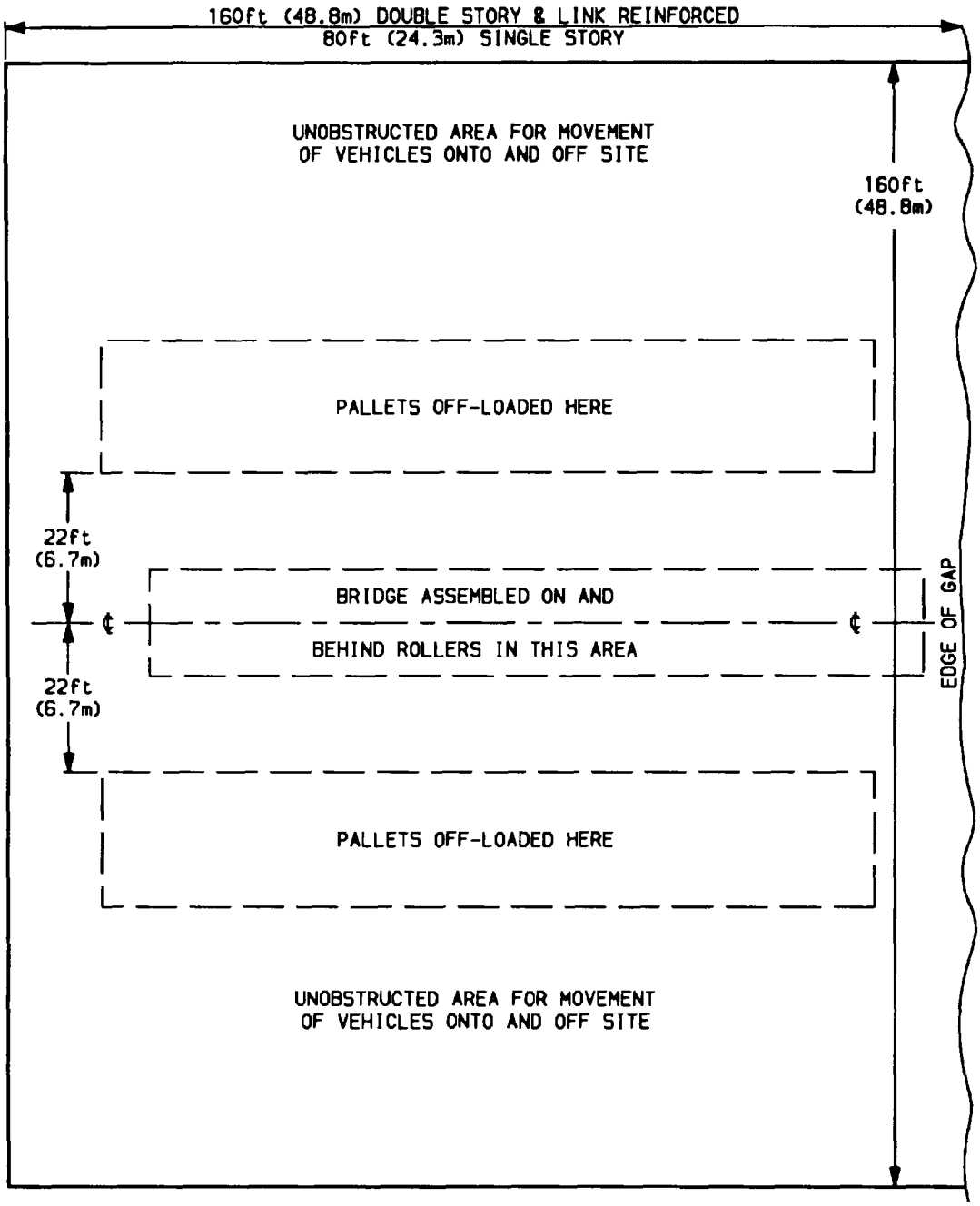


FIGURE 3-3. Assembly site

e. Height of banks above flowing water

(1) Single story bridges. The bank heights above flowing water or obstructions in the gap should be a minimum of 2 ft (0.6 m).

(2) Double story bridges (2E + 1 thru 2E + 12 bay). The bank height above flowing water or obstructions in the gap should be a minimum of 2 ft (0.6 m).

(3) Link reinforced bridges. The bank heights above flowing water or obstructions in the gap should be a minimum of 12.0 ft (3.7 m). In addition, there must be no obstacle intruding above a plane inclined 20 degrees downward in the gap for a distance of 15 ft (4.6 m) from each AR Peg as shown below (fig. 3-4).

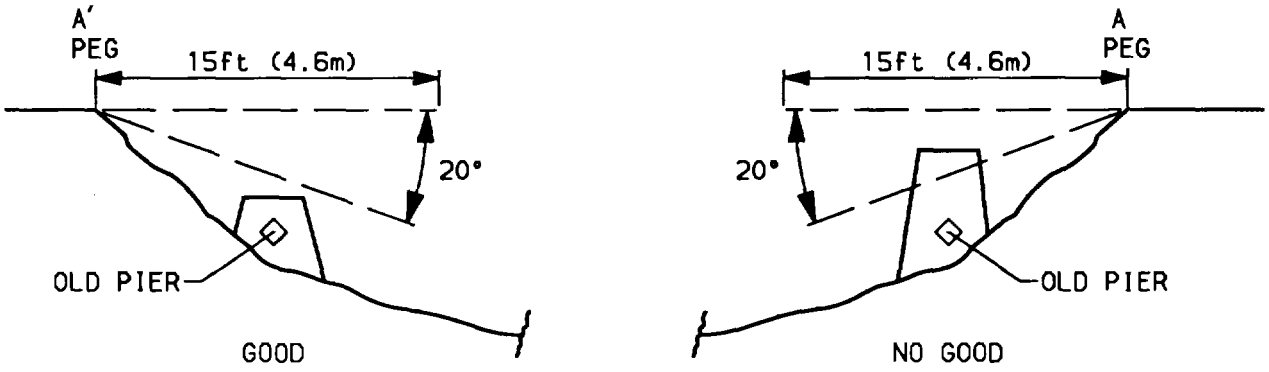


FIGURE 3-4. Bank clearance-link reinforced bridges

If the bank height is less than 12.0 ft (3.7 m) the rules in (a) and (b) below apply.

(a) For bridges 2E + 14 bays and below there is no limit on bank height as long as the current does not exceed 5 fps (1.5 m/s) in which the reinforcing links can be immersed during launching and before tensioning.

(b) For bridges 2E + 15 bays and above there is no limit on bank height as long as the current does not exceed either:

1 3.5 fps (1.0 m/s) in which case the reinforcement can be immersed only during launching and before tensioning.

2 The current speed is shown in Table 3-4.

TABLE 3-4 Maximum current velocity v bridge length

2E + No. of Bays		22	21	20	19	18	17	16	15	14	13
Bridge Length	ft	162	156	150	144	138	132	126	120	114	108
	m	49.4	47.6	45.7	43.9	42.1	40.2	38.4	36.6	34.8	32.9
Current on immersed links	fps	1.64	1.64	3.08	3.67	3.93	4.29	6.95	7.67	8.43	8.43
	m/s	0.5	0.5	0.94	1.12	1.2	1.31	2.12	2.34	2.57	2.57

f. Wind Speed

The wind speed permitted for each bridge length is given below. The bridge will require lateral anchorage before crossing vehicles when wind speed exceeds those given in Table 3-5.

TABLE 3-5 Maximum wind speed v bridge length

2E + No. of Bays		22	21	20	19	18	17	16	15	14	13
Bridge Length	ft	162	156	150	144	138	132	126	120	114	108
	m	49.4	47.6	45.7	43.9	42.1	40.2	38.4	36.6	34.8	32.9
Wind Speed	mph	50	50	95	120	120	120	120	120	120	120
	km/h	80.5	80.5	152.9	193.1	193.1	193.1	193.1	193.1	193.1	193.1

g. Vehicle Access

An area large enough to allow the trucks and bolster trailers to completely turn around so that they can back into the site, is required adjacent to the bridge site.

A vehicle park, covered and concealed, should be located from 0.3 to 3.1 miles (0.5 to 5 kms) behind the bridge site, in which the trucks and trailers can be parked after off loading.

3-6 RECONNAISSANCE REPORT

a. Before any attempt is made to begin installation of MGB, the unit that will construct the bridge should be furnished a reconnaissance report. This report must contain the following information as a minimum. Minimum information will be used to determine length and type of bridge.

(1) Location of the site, map coordinates or specific directions from the base camp to the site.

(2) Width of gap (AR Gap) on bridge centerline. The unit must know the AR Gap in order to plan the mission, as the military load class (MLC) and the AR Gap will be applied to tables to determine the length and type of bridge needed.

b. If only the minimum information is provided, bridge unit personnel will have to conduct a reconnaissance to obtain elevations, site conditions and other design related information.

3-7 CHOICE OF BRIDGE LENGTH AND CLASS

a. Bridge Length. Use the AR gap from the reconnaissance report to find the length of bridge in Table 36. The AR gap ranges have been computed for each bridge length, taking into account the minimum and maximum bearing for all MGB's.

b. Bridge Class. The Military Load Class (MLC) is given in Table 36 for all bridge lengths and configurations.

TABLE 3-6 Bridge Selection Tables

SS 4 - 12 Bays			DS 1 - 12 Bays			DS 13 - 22 Bays w/o LRS			DS 13 - 22 Bays w/LRS		
AR Gap m	MLC*	No. of Bays	AR Gap m	MLC (T)*	No. of Bays	AR Gap m	* MLC	No. of Bays	AR Gap m	MLC (T)*	No. of Bays
3.7 - 7.1	70(T)	4	6.4 - 9.0	70	1	28.3 - 30.9	50	13	28.3 - 30.9	70	13
5.6 - 9.0	70(T)	5	8.2 - 10.8	70	2	30.2 - 32.8	50	14	30.2 - 32.8	70	14
7.4 - 10.8	40	6	10.0 - 12.6	70	3	32.0 - 34.6	40	15	32.0 - 34.1	70	15
9.2 - 12.6	30	7	11.9 - 14.5	70	4	33.8 - 36.4	40	16	33.8 - 36.4	70	16
11.0 - 14.4	30	8	13.7 - 16.3	70	5	35.6 - 38.2	30	17	35.6 - 38.2	70	17
12.9 - 16.3	24	9	15.5 - 18.1	70	6	37.5 - 40.1	30	18	37.5 - 40.1	70	18
14.7 - 18.1	20	10	17.3 - 19.9	70	7	39.3 - 41.9	24	19	39.3 - 41.9	70	19
16.5 - 19.9	16	11	19.2 - 21.8	70	8	41.1 - 43.7	24	20	41.1 - 43.7	70	20
18.4 - 21.8	16	12	21.0 - 23.6	70	9	43.0 - 45.6	20	21	43.0 - 45.1	70	21
			22.8 - 25.4	70	10	44.8 - 47.4	16	22	44.8 - 46.2	70	22
			24.7 - 27.3	70	11						
			26.5 - 29.1	70	12						

* See Table 1-1 for transverse slope and crossing restrictions, and MLC 100(W) capability. (T) = Tracked

EXAMPLE: Given a mission to provide an MGB with an MLC and the reconnaissance report gives an AR Gap of 23.8m. Read down the AR Gap range columns under the different sections (A through D) until a range of gaps is found that will bracket the AR Gap given. The first range found is 21.Om -23.6m, followed by a second range, 22.8m - 25.4m, which also brackets the AR Gap. The procedure for determining which range to use will be discussed later. What can be determined at this point is that a DS 2E+9 or a 2E+ 10 bay bridge will span the AR Gap given, provide a MLC 70 capability, and that you must go to paragraph 3-14 for further design procedures.

c. Bridge Selected. Using the bridge selected, go to the appropriate paragraph:

* paragraph 3-12.4 - 12 Bay SS Design.

* paragraph 3-13, 9-12 Bay SS Design on restricted sites.

* paragraph 3-14, 2E+1 - 2E+12 Bay DS Design.

* paragraph 3-15, 2E+1 - 2E+12 Bay Design on restricted sites.

* paragraph 3-16, 2E+13 - 2E+22 Bay DS (w/oLRS) Design.

* paragraph 3-17, 2E+13 - 2E+22 Bay DS (w/LRS) Design.

3-8 RIDGE CONSTRUCTION TIMES

a. Building times for various bridge lengths are given in Table 1-6. These times are figured from the downloading of the first pallet load on site to the opening of the bridge for traffic.

b. The time for construction can be decreased through drill training and thorough planning of the mission.

c. Poor site conditions, inclement weather, and unskilled personnel will increase construction time.

3-9 WORK PARTY REQUIRED

The work parties required for all MGB's are given in Table 1-5. Decreasing the size of the work party will considerably increase building times. Increasing the number of personnel will not necessarily decrease the building times.

Section IV. Design

MGB design is a two phase operation to determine the length of the bridge, type of construction, correct setting of roller beams, setting of the launching nose cross girder, and determining the time, personnel, and bridge loads required.

3-10 DESIGN PHASE 1

In this phase, the preliminary studies, site selection and reconnaissance are performed to determine the bridge length, type of construction, and the location and elevations of the key construction points on the site. This is the onsite phase. Two parts of this phase are common to all bridge lengths (measuring the AR Gap and selecting the bridge).

a. Measure the angle of repose (AR) Gap

(1) Select a bridge centerline. The length of the centerline (on each bank) will be determined by the R distance (construction space) required for the bridge that will be built. R Distances range from 5.8m to 40.5m (does not include the length of the launch vehicle or the push bar). Initially a centerline should extend approximately 5.0m on each bank. Once the AR Gap and the bridge length has been determined, the centerline will be extended to the correct R Distance plus the length of the launch vehicle and the push bar. This will ensure that there is sufficient space on both banks for vehicle access or egress, and space on the near bank for construction of the bridge. There should be sufficient clear area extending out 3.0m on both sides of the centerline for its full length to allow for bridge construction. Additional clearance on each side is required for pallet placement and off-loading.

(2) Determine the location of firm ground on both the near and far banks.

(a) For the field method of determining firm ground, assume the AR of the soil to be at 45 degrees. The soil bearing capacity should be at least 2 tons per square foot. Capacities less than 2 tons will require placement of timber packing under the bridge.

(b) At the edge of firm ground on the near bank, place the A' peg. At the edge of firm ground on the far bank, place the A peg. The distance between the two pegs is known as the AR Gap. Keep in mind that the MGB must not bear on the ground for more than 2.1m (for SS) or 2.3 m (for DS), regardless of its length.

1 If the actual slope of the bank does not exceed 45 degrees from the horizontal, place A and A' pegs as shown in Figure 3-5

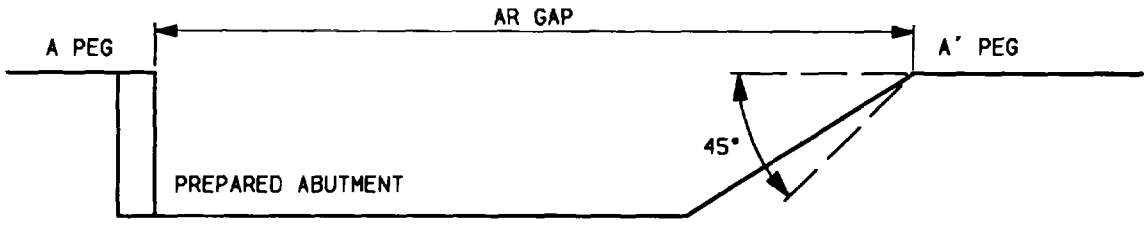


Figure 3-5. Angle of Repose with Slope of Bank Less than 45 degrees.

2 If the actual slope of the bank does exceed 45 degrees from the horizontal, place A and A' pegs a distance H from the toe of slope which is equal to the height of the bank measured from the toe of slope to the top of the gap, as shown in Figure 3-6.

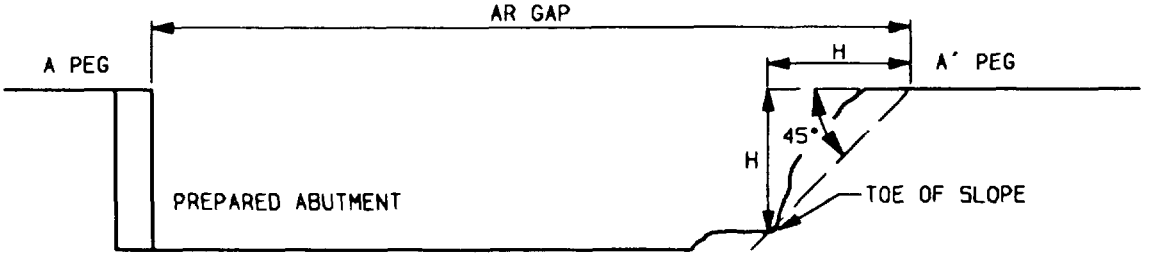


FIGURE 3-6 Angle of Repose with Slope of Bank More than 45 degrees

NOTE

Use a bit of "common sense " when applying 1 and 2 to an actual gap.

3 Measure the distance from the edge of firm ground on the near bank (A peg) to the edge of firm ground on the far bank (A peg) using one of the methods described below. This distance is known as the AR Gap.

- Triangulation method
- A string line with a weight attached thrown across the gap and measured while being retrieved.
- If in a relatively secure area and site conditions allow, a tape measure should be used.

b. Select Bridge

Select the type of bridge to be built, based on AR Gap, MLC required, and resources available. This step is common to all lengths and configurations.

(1) Apply the AR Gap determined to the AR Gap Range columns of Table 3-6 starting with section A, then 8, C, and finally D.

(2) Read down the columns until an AR Gap Range is found that brackets the AR Gap measured.

(a) Read across to check the MLC given against the MLC required by the testing authority. The MLC given must meet or exceed the MLC required.

(b) Consideration must be given at this time to the soil bearing capacity and the bearing requirements of the bridge.

1 If the AR Gap measured is closer to the lower part of the range, then the bridge will be approaching maximum bearing on the ground.

2 If the AR Gap measured is closer to the higher part of the range, then the bridge will be approaching the minimum bearing on the ground.

(c) It is also necessary to consider the amount and type of traffic and weather, eg, will the bridge take large numbers of heavy tracked vehicles during 24 hours of rain.

(d) At this point, decide whether the first AR Gap range found provides the best bridge for the expected mission, or if you will have to go to the next higher AR Gap range and bridge.

EXAMPLE.

1. AR Gap measured = 5.7m
MLC required = 70

2. Select *Bridge. First* AR Gap *range* that *brackets 5.7m is in Section (a), Single Story 4-12* Bays. *The range is 3.7 - 7. 1m, 4 bay bridge with MLC 70. The next range also brackets 5 7m, 5.6 - 9.0m, 5 bay bridge with MLC 70.*

a. At this point, look at the soil bearing capacity, traffic loads, and weather. If the soil bearing capacity is low and large numbers of heavy vehicles are to cross during Inclement (rainy) weather, it would be wise to build the 5 bay bridge. The 5 bay would have *more bridge bearing on the ground (on* each *bank) than the 4 bay.*

b. If the soil bearing capacity is high, and the vehicle traffic is expected to be light and weather fair the 4 bay bridge might be suitable, *it would conserve resources. The 4 bay would have less bridge bearing on the ground (on each bank) than the 5 bay.*

3. Once the AR *Gap Range has been determined, proceed to the appropriate paragraph.*

* *paragraph 3-12, 4-72 Bay SS Design.*
* *paragraph 3-13, 9-12 Bay SS Design on restricted site*
* *paragraph 3-14, 2E+1 - 2E + 12 Bay DS Design*
* *paragraph 3-15, 2E+1 - 2E+12 Bay DS Design on restricted site*
* *paragraph 3-16, 2E+13 - 2E+22* Bay DS (w/oLRS) *Design.*
* *paragraph 3-17, 2E+13 - 2E+22 Bay DS (w/LRS) Design.*

3-11 DESIGN PHASE 2.

In this phase, the information obtained in phase 1 is used to determine the height setting of the roller beams and the position of the launching nose cross girder. This phase is usually done in a rear area, away from the site.

3-12 SINGLE STORY *4* thru 12 BAY DESIGN

The procedures that follow are for design of SS 4 through 12 bay MGBs on normal sites only:

a. Measure the AR Gap (para. 3-10a)

b. Select a bridge (para. 3-10b and Table 3-7 and 3-8)

TABLE 3-7. SS Bridges 4 through 8 bays
Site and Bridge Dimensions

AR Gap Ranges (a)	MLC* (b)	No. of Bays (c)	Brg Lgth (d)	R Dist (e)	Nose Const (f)
3.7 - 7.1	70(T)	4	7.9	5.8	
5.6 - 9.0	70(T)	5	9.8	6.7	
7-4 - 10.8	40	6	11.6	7.6	LLN
9.2 - 12.6	30	7	13.4	9.5	ONLY
11.0 - 14.4	30	8	15.2	11.3	

TABLE 3-8. SS Bridges 9 through 12 bays
Site and Bridge Dimensions

AR Gap Ranges (a)	MLC* (b)	No. of Bays (c)	Brg Lgth (d)	R Dist (e)	Nose Const (f)
12.9 - 16.3	24	9	17.1	10.4	5N1
14.7 - 18.1	20	10	18.9	12.2	5N1
16.5 - 19.9	16	11	20.7	12.2	6N1
18.4 - 21.8	16	12	22.6	14.0	6N1

* - See step k. Slope Check and Table 1-1 forcrossing restrictions and MLC 100(W) capability. (T) = Tracked

c. Bridge length

Read and note the number of bays and bridge length, Table 3-7 and 3-8 columns (c) and (d).

d. R Distance

Read and note the R Distance, Table 3-7 and 3-8 column (e).

e. Nose construction

Read and note the nose configuration, Table 3-7 and 3-8 column (f).

f. Key construction points

Identify, locate, and take elevations at the key construction points. These construction points are explained below and shown in Figures 3-7 and 3-8

(1) F peg-Designates the location of the far bank end of bridge (outer edges of bankseat beam). Initially placed 0.4m (minimum acceptable) from the A peg on the far bank. This 0.4m, between the A and F pegs is the amount of bridge that will bear on the far bank, and is known as the far bank bearing.

(2) A peg-Edge of firm ground on the far bank.

(3) A' peg-Edge of firm ground on the near bank.

(4) AR Gap-The distance measured between the A and A' pegs. This is the actual gap to be spanned by your bridge.

(5) F' peg-Designates the location of the near bank end of bridge (outer edge of bankseat beam). The distance (determined later), from the A'to F' peg is the amount of bridge that will bear on the near bank, known as the near bank bearing. The minimum acceptable near bank bearing is 0.4 m.

(6) RB peg-Designates the position of the roller beam (RB). It may be in one of two different positions depending upon the launch method used, push launch (4 or 5 bays) or jack launch (4 through 12 bays).

NOTE

Push launches are to be performed only when it Is operationaly necessary (see Chap. 5, Sect. I, para. b). Push launches are no longer performed for training or demonstration purposes.

(a) Push launch. The distance X to the RB peg is calculated by using the position of the A' peg on the near bank, bridge length (L), AR Gap, minimum bearing requirement (0.4 m), and the approximate

distance the bridge falls in front of the roller beam (0.23 m).

X = (L + 0.23 m) - (AR Gap + 0.4 m)

NOTE

To adhere to minimum/maximum bearing rules without having to dig out or pack up under the end of bridge, you must ensure that the RB peg Is placed between 0.63 m and 2.33 m from the A' peg.

(b) Jack launch. The distance X to the RB peg is calculated by using the position of the A' peg on the near bank, bridge length (L), AR Gap, minimum bearing requirement (0.4 m), and the approximate distance required behind the roller beam (0.23 m) to attach the jacks.

X = (L - 0.23 m) - (AR Gap + 0.4 m)

NOTE

To adhere to minimum/maximum bearing rules without having to dig out or pack up under the end of bridge, you must ensure that the RB peg Is placed between 0.17 m and 1.87 m from the A' peg.

(7) O peg-Marks the clear distance behind the roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 3-7 or 38, column (f), behind the RB peg

g. Calculate Bearing

The minimum and maximum bearings for all SS bridges are shown in the Table 3-9 and on Figures 3-7 and 3-8

TABLE 3-9. Bearings

Bearings	Near Bank	Far Bank
Minimum	0.4 m	0.4 m
Maximum	2.1 m	2.1 m

(1) Push launch. To calculate the actual location of the F' peg:

X - 0.23 m = Near bank bearing

(2) Jack launch. To calculate the actual location of the F' peg:

X + 0.23 m = Near bank bearing

h. Check bearing

(1) If the near bank bearing is within the minimum and maximum bearing limits, there is no need to shift the position of the F and F' pegs. The position will be as initially determined, F peg 0.4 m from A peg and the F' peg will be placed the distance determined as near bank bearing measured from the A' peg.

(2) If the near bank bearing is more than the maximum bearing allowable (2.1 m), it will be necessary to shift bearing.

I. Shift bearing

(1) Determine the amount of excess near bank bearing by subtracting the maximum bearing allowed from the amount calculated using g.(1) or g.(2) above. At this point decide how to use the excess bearing as follows:

either

(a) Add the excess bearing to the initial far bank bearing (0.4 m)

or

(b) Add the initial far bank bearing and near bank bearings together, then divide by 2, resulting in an equal amount of bearing on both banks

or

(c) Add the initial far bank and near bank bearings together, then divide the total bearing as necessary, as long as minimums are met and maximums are not exceeded.

(2) Regardless of what is done, the locations of the F, F', RB, and O pegs will change or shift on the site. The location of the A and A' pegs do not change, nor does the width of the AR Gap.

(3) There are situations that will result in the maximum bearings being exceeded on both banks, due to overlaps of gaps and bridge lengths or by making an error in the design process. When this occurs the options are as follows:

either

(a) Dig out the soil from the bank until the bearing area will be less than maximum.

or

(b) Pack up (place timbers) under the end of bridge upon completion. This packing must provide enough bearing surface to equal the minimum bearing for the bridge.

j. Key construction points

Locate the key construction points on the site and take elevations as follows:

(1) Estimate or measure the elevations of the F, RB, and O pegs. Convert the elevation of the RB to datum, 0.0 elevation. The elevations will be used to assist in determining the value of H (height of the far bank), which will be compared to the value of N (amount of nose lift).

(2) Convert the elevations of the F and O pegs, using the RB as Datum. Elevations above the Datum line are positive, elevations below the Datum are negative.

(3) Determine X.

For push launch X = (L + 0.23 m) - (AR Gap + 0.4 m)

For jack launch X = (L - 0.23m) - (AR Gap + 0.4m)

(4) Place the elevations on the pro-forma as shown in Figure 3-7 or 3-8.

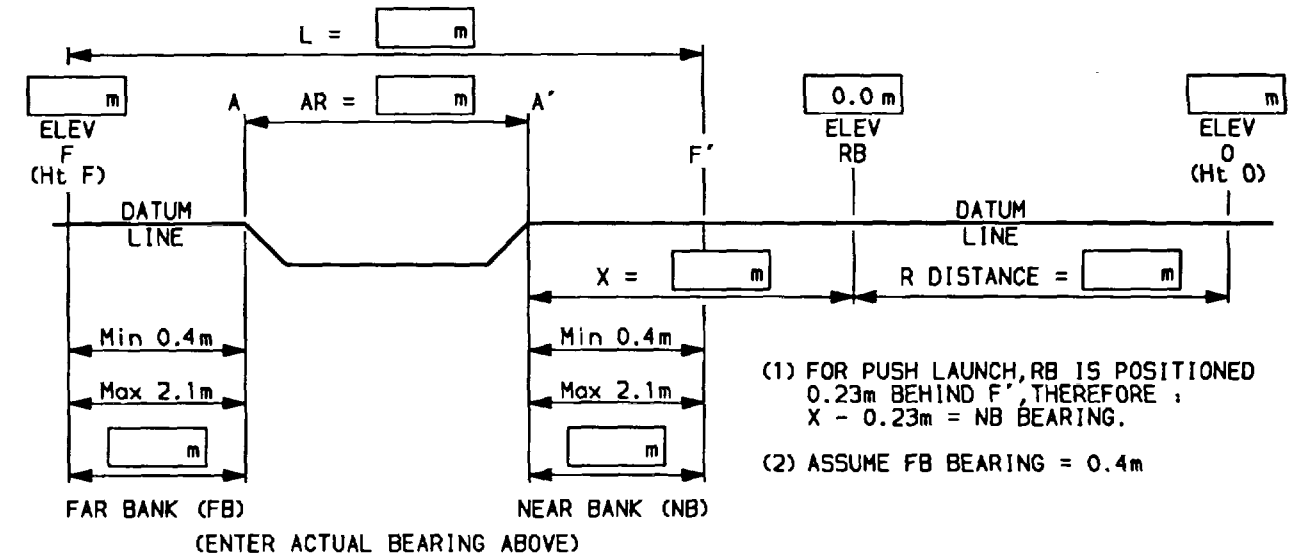


Figure 3-7 Site Profile for Push Launch

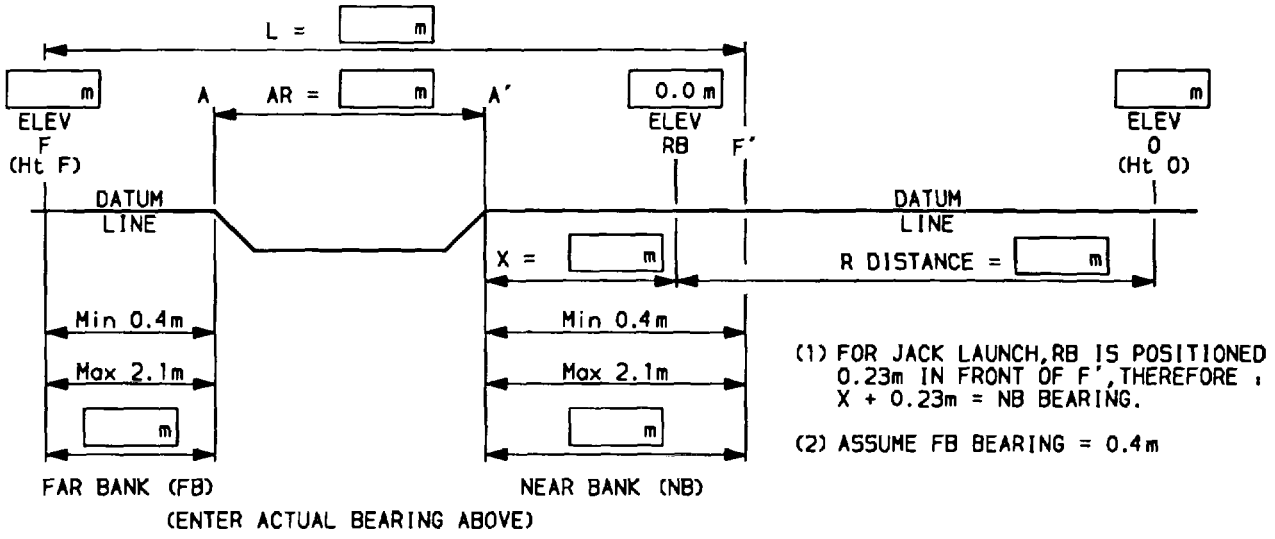


FIGURE 3-8 Site Profile for Jack Launch.

k. Slope check

(1) Longitudinal. Ensure that the difference in elevation between the F' (use elevation of RB) and F peg does not exceed 1/lo th of the total bridge length. If it does, it will be necessary to crib up, undertake a major construction project, or find another centerline.

(2) Transverse/cross. Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m) for MLC 60 and below and 1/20 th of the bridge width (4.0 m) for MLC 61 and over. No transverse slope is permitted for MLC 100(W).

I. Calculate H

Calculate H, (for later comparison against N, see Figure 3-9). The value H is the height of the far bank at the F peg relative to a baseline which is drawn through the RB and 0 pegs. The baseline extends from behind the 0 peg on the near bank to a point beyond the F peg on the far bank.

(a) For push launch.

$$H = \text{Elev F} + \frac{\text{Elev 0} \times (.L + 0.23\ \text{m})}{\text{R Distance}}$$

(b) For jack launch

$$H = \text{Elev F} + \frac{\text{Elev 0} \times (L - 0.23\ \text{m})}{\text{R Distance}}$$

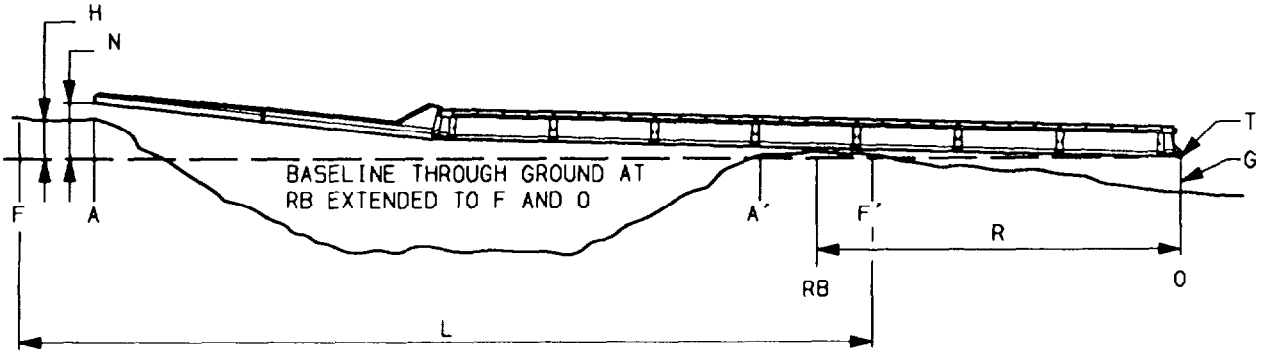


FIGURE 3-9 Key Construction Points for SS 4-12 Bay

m. Launch design

TABLE 3-10. SS Bridges 4 thru 8 Bays Launch Design

4 Thru 8 Bays (from below)
Choose a RB set-up and packing (if required) to give N > H RB set-up & packing _____ (from columns g or h and Note 3)

No. of Bays	N, BP only (g)	N, BP + DU ** (h)
4	1.30	1.98
5	1.14	1.91
6	1.07	1.83
7	0.76	1.14
8	0.38	1.07

TABLE 3-11. SS Bridges 9 thru 12 Bays

9 Thru 12 Bays (from below)
Choose a LNCG setting, RB set-up, and packing (if required) to give N > H LNCG Setting _____ RB set-up & Packing _____ (from cols g through I & Note 3)

Dimension N above/below line through ground at RB and 0 when rear BSB is on ground. The RB is set-up on BP or BP and DU, and LNCG is on setting No. 4, No. 2, or No. 1.

	LNCG Settings					
	No. 4		No. 2		No. 1	
	Black		Black		Black	
No. of Bays	BP Only (g)	BP+DU ** (h)	BP Only (i)	BP+DU ** (j)	BP Only (k)	BP+DU ** (i)
9	-0.76	0.15	0.61	1.37	1.83	2.59
10	-0.99	-0.38	0.38	0.9	1.60	2.21
11	-1.37	-0.84	0.15	0.71	1.83	2.67
12	-2.13	-1.37	-0.46	0.31	1.07	1.83

NOTES:

1. An extra 75 mm of clearance can be obtained by lifting the nose to take out the pin sag. Where levels are estimated, this should not be taken into account during the design, but left to compensate for any errors in calculating the value of H (for bridges 4 through 8 bays).

2. An extra 0.6 m of clearance can be obtained by lifting the nose to take out the pin sag (for bridges 9 through 12 bays).

3. Any additional packing under the RB will increase the vertical interval N by three times the thickness of the packing (e.g., if the packing is 75 mm thick, N will be increased by 225 mm).

4. The table incorporates an allowance to ensure that the nose clears the LR when it is positioned 230 mm in front of the F peg.

5. Height of the roller beam on baseplate only is 0.43 m. Height of the baseplate and deck unit is 0.60 m.

** Plus 7.62 cm of timber packing between BP and DU.

n. Loads required

From Table 3-12, determine the truck and trailer toads required for the bridge.

TABLE 3-12. MGB Pallets SS

Pallet Type	No. of Bays			
	4 - 5	6 - 7	8 - 9	10-12
Erection	1	1	1	1
Bridge	1	2	3	4
Total	2	3	4	5

NOTE

Additional vehicles are required to transport personnel. Erection pallets may be partial depending on the bridge being built.

o. Manpower and construction time

From Table 3-13, determine the manpower and construction time requirements

TABLE 3-13. Working parties and building times on good sites

(a)	Single Story Single Span		
	4-5 Bays (b)	6-8 Bays (c)	9-1 2 Bays (d)
Working party	1 + 8	1 + 16	1 + 16
Time by day (hours)	1/2	3/4	1
Time by night (hours)	3/4	1	1 1/4

NOTES:

1. All timings exclusive of work on approaches.
2. Add 20 percent for unskilled personnel.
3. Add 30 percent for inclement weather.
4. Add 30 percent for adverse site conditions.

p. Final design

During the preceding design process, the information necessary to fill in the blanks below would have been obtained. Fill in these figures in the pro-forma, at this point the design is considered complete.

a. No. of Bays _____ b. LNCG Setting _____

c. Set-up of RB _____ and Packing Required _____

d. Bearing : NB _____ FB _____ e. TruckTrailer Loads _____

f. Manpower Required _____ g. Time to Construct _____

13-13 SINGLE STORY 9 thru 12 BAY DESIGN ON RESTRICTED SITES

The design procedures for SS bridges (9 through 12 bay) on restricted sites is the same as for normal sites except that:

a. The maximum R Distance during construction is 8.2 m, see Table 3-14.

b. The launching nose length is increased by one launching nose heavy (LNH) section, see Table 3-14.

c. Counterweights are required as described, see Table 3-14.

TABLE 3-14. SS Bridges (9 through 12 bay) on Restricted Sites

No. of Bays	R Distance	Nose Const	Counterweights Required
9	8.2	6N1	1 BSB, 3 Deck units, 2 Top panels
10	8.2	6N1	1 BSB, 3 Deck units, 2 Top panels
11	8.2	7N1	1 BSB, 3 Deck units, 4 Top panels
12	8.2	7N1	1 BSB, 3 Deck units, 4 Top panels

13-14 DOUBLE STORY 2E + 1 thru 2E + 12 BAY DESIGN

The procedures that follow are for design of DS 2E + 1 thru 2E + 12 bay MGBs on normal sites only:

a. Measure the AR Gap (para. 3-10a)

b. Select a bridge (para. 3-10b and Table 3-15)

TABLE 3-15. DS MGB Design 2E + 1 thru 2E +12 Bays Site and Bridge Dimensions

AR Gap Ranges (a)	MLC* (b)	2E + No. of Bays (c)	Bridge Length L (d)	R Distance (e)	Nose Const (f)
6.4 - 9.0	ALL MLC 70(T)	1	11.0	10.0	2N1
8.2 - 10.8		2	12.8	11.9	3N1
10.0 - 12.6		3	14.6	12.2	
11.9 - 14.5		4	16.5	13.1	
13.7 - 16.3		5	18.3	14.9	4N1
15.5 - 18.1		6	20.1	14.9	
17.3 - 19.9		7	21.9	15.8	
19.2 - 21.8		8	23.8	16.8	5N1
21.0 - 23.6		9	25.6	17.7	
22.8 - 25.4		10	27.4	19.5	
24.7 - 27.3		11	29.3	20.4	6N1
26.5 - 29.1		12	31.1	21.6	6N1

* See step k. Slope Check and Table 1-1 for crossing restrictions and MLC 100(W) capability. (T) = Tracked

c. Bridge length

Read and note the number of bays and bridge length, Table 3-15 columns (c) and (d).

d. R Distance

Read and note the R Distance, Table 3-15 column (e).

e. Nose configuration

Read and note the nose configuration, Table 3-15 column (f).

f. Key construction points

Identify, locate, and take elevations at the key construction points. These constructions points are explained below and shown in Figure 3-10.

(1) F Peg-Designates the location of the far bank end of bridge (outer edge of bankseat beam). Initially placed 0.6 m (minimum acceptable) from the A peg on the far bank. This 0.6 m, between the A and F pegs is the amount of bridge that will bear on the far bank, and is known as the far bank bearing.

(2) A Peg-Edge of firm ground on the far bank.

(3) AR Gap-The distance measured between the A and A' pegs. This is the actual gap to be spanned by your bridge.

(4) A' Peg-Edge of firm ground on the near bank.

(5) F' Peg-Designates the location of the near bank end of bridge (outer edge of bankseat beam). The distance (determined later),from the A' to F' peg is the amount of bridge that will bear on the near bank, known as near bank bearing. The minimum acceptable near bank bearing is 1.4 m.

(6) FRB Peg-Designates the position of the front roller beam (FRB). The distance from the A' peg to the center of the FRB can not be less than 0.9 m, and from the FRB to the F' peg can not be less than 0.5 m. The placement of the FRB is determined by using the length of bridge (L), AR Gap, far bank bearing, and bridge overhang (0.5 m) to obtain an X distance (from A' to FRB). Placement of the FRB in this manner will ensure minimum effort during the jack down operation.

(7) RRB Peg-Designates the location of the rear roller beam (RRB). It is placed 4.6 m from the FRB (measured center to center).

(8) O Peg-Marks the clear distance behind the front roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 3-15, column (f), behind the FRB peg.

g. Calculate bearing

The minimum and maximum bearings for all DS bridges are shown in the Table 3-16 and Figure 3-10. To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing = bridge length (L) - (AR Gap + 0.6 m)

Where: Bridge length is obtained from column (d) of Table 3-15.
The AR Gap was measured in the first step of the design procedure.
An assumption of 0.6 m is made at this point in the calculation sequence be cause this is in the minimum acceptable bearing allowed on the far bank.

TABLE 3-16. Bearings DS 1-12 Bay

Bearings	Near bank	Far bank
Minimum	1.4 m	0.6 m
Maximum	2.3 m	2.3 m

h. Check bearing

(1) If the near bank bearing is within the minimum and maximum bearing limits, it will not be necessary to shift the position of the F and F' pegs. The position will be initially determined, F peg 0.6 m from A peg and the F' peg will be placed the distance determined as near bank bearing measured from the A' peg.

(2) If the near bank bearing is more than the maximum bearing allowed (2.3 m), it will be necessary to shift the bearing.

I. Shift bearing

(1) Determine the amount of excess near bank bearing by subtracting the maximum bearing allowed from the amount calculated. At this point decide how to use the excess bearing as follows:

either

(a) Add the excess bearing to the initial far bank bearing (0.6 m).

or

(b) Add the initial far bank and near bank bearings together, then divide by 2, resulting in an equal amount of bearing on both banks.

or

(c) Add the initial far bank and near bank bearings together, then divide the total bearing as you see fit, as long as minimums are met and maximums are not exceeded.

(2) Regardless of what is done, the locations of the F, F', FRB, RRB and O pegs will not change or shift on the site. The location of the A and A' pegs do not change, nor does the width of the AR Gap.

(3) There are situations that will result in the maximum bearings being exceeded on both banks, due to the overlaps of gaps and bridge lengths or by making an error in the deign process. When this occurs:

either

(a) Dig out the soil from the bank until the bearing area will be less than the maximum.

or

(b) Pack up (place timbers) under the end of bridge upon completion. This packing must provide enough bearing surface to equal the minimum bearing for the bridge.

j. Key construction points

Locate the key construction points on the site and take elevations as follows:

(1) Estimate or measure the elevations of the F, FRB, RRB, and O pegs. Convert the elevation of the FRB to Datum, 0.0 elevation.

(2) Convert the elevations of the F, RRB and O pegs, using the FRB as Datum. Elevations above the datum lines are positive, elevations below Datum are negative.

(3) Place the elevations on the pro-forma as shown in Figure 3-10.

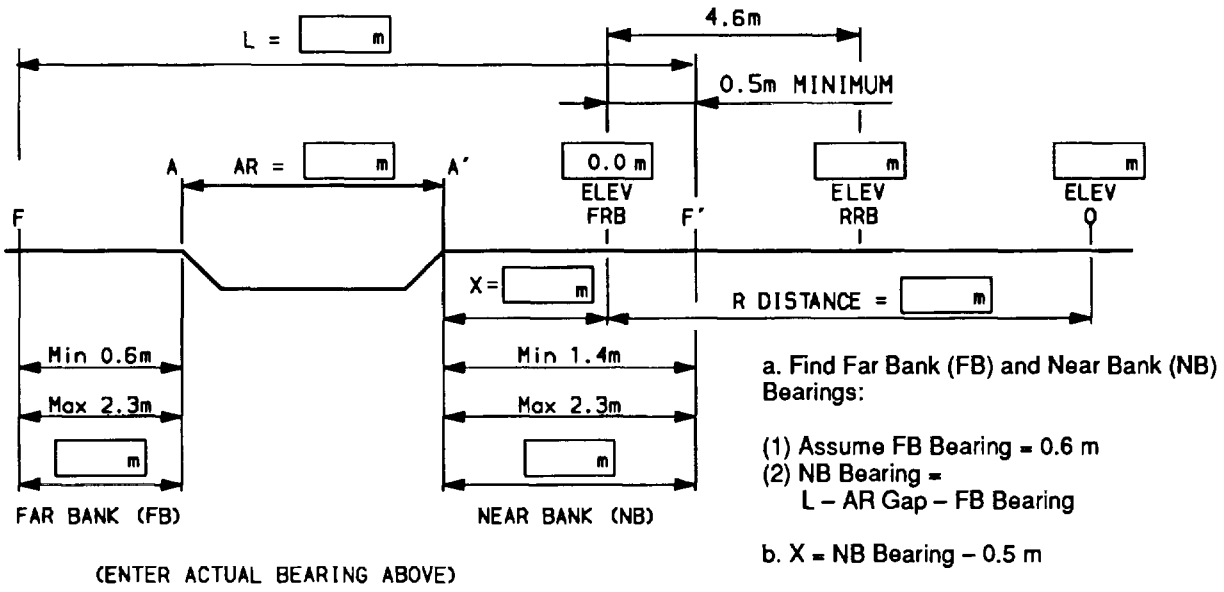


Figure 3-10 Site Profile-DS 1-12 Bay

k. Slope check

(1) Longitudinal: Ensure that the difference in elevation between the F and F' (use elevation of FRB) pegs does not exceed 1/loth of the total bridge length. If it does, either pack up under the bridge, dig out from under the end(s) of the bridge, or find another centerline.

(2) Transverse/cross: Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m) for MLC 60 and below and 1/20th of the bridge width MLC 61 and over. No transverse slope is permitted for MLC 100(W). If these figures are exceeded, either pack up under the bridge, dig out from under the end(s) of the bridge, or find another centerline.

I. Calculate H, G and C

Calculate the far bank height (H), ground (at tail of bridge) clearance (G), and water (at front of bridge) clearance (C), for later comparison against N (nose lift), T (tail lift), and D (deflection). The values of N, H, T, and G are relative to a baseline drawn through the FRB and RRB. C and D are relative to the FRB/F line drawn from the FRB to F peg.

$$H = \text{Elev F} + \frac{\text{Elev RRB x (L - 0.5 m)}}{4.6\text{m}}$$

$$G = \text{Elev O} - \frac{\text{Elev RRB x R Distance}}{4.6\text{m}}$$

$$C = \text{Elev WL} - \frac{\text{Elev F x W Distance}}{(\text{L} - 0.5\text{m})}$$

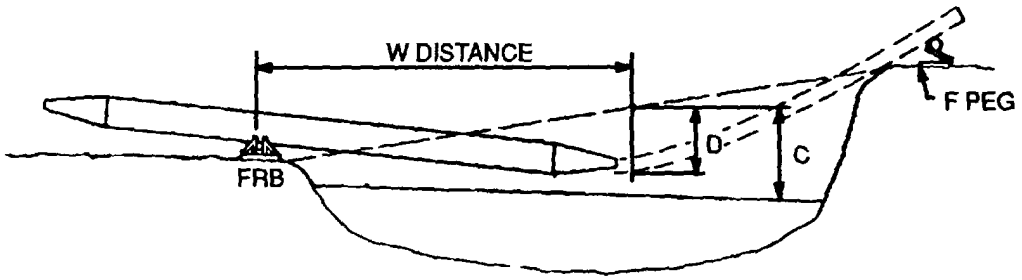


FIGURE 3-11 DOUBLE STORY-DISTANCE D, W & C

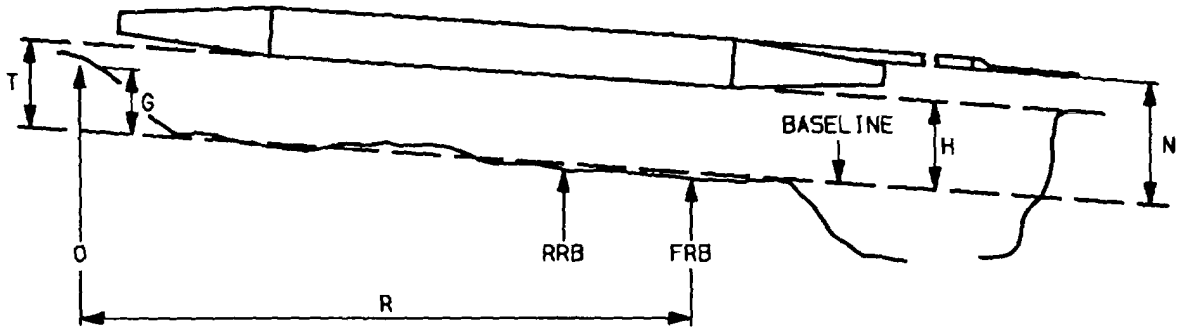


FIGURE 3-12 DOUBLE STORY-DISTANCE R, T, G, H, & N

m. Rule 1

Choose an LNCG setting from Table 2-14, columns (h), (i), or (j) that ensures that the value of D from Table 3-17, column (g) (from FRB/F line to the point of maximum deflection) is greater than the depth of C (from FRB/F line to WL).

(1) If both bank heights are greater than 0.6 m above the waterline, go to Rule 2.

(2) If either or both bank heights are less than 0.6 m from the waterline, choose an LNCG setting from column (h), (i) or (j) so that D is greater than C to avoid immersion in water, and go to Rule 2

(3) If D is greater than C, go to Rule 2.

(4) If D is not greater than C and the water is not flowing, go to Rule 2.

(5) If D is not greater than C and immersion in water is less than 0.3 m and the current velocity is less than 5 meters per second (mps), it is not essential to adjust the LNCG setting. Therefore, go to Rule 2.

(6) If D is not greater than C and the current velocity is greater than 5 mps, another site must be chosen

TABLE 3-17. Rule 1 - DS 1 thru 12 Bay

D given for LNCG setting with FRB and RRB in low position.				
2E + No. of Bays	W Distance (g)	Setting No.6 Yellow (h)	Setting No.4 Yellow (i)	Setting No.2 Yellow (j)
1-6	- -	- -	- -	- -
7	13.1	0.70	0.31	-0.09
8	15.0	0.67	0.25	-0.20
9	16.5	0.64	0.21	-0.30
10	17.6	0.60	0.12	-0.40
11	18.5	0.50	0.04	-0.43
12	19.2	0.46	-0.06	-0.58

n. Rule 2

Use a LNCG setting from Table 3-18, columns (k), (I) or (m) to give N > H and T > G. Both roller beams are in the low position.

(1) Using the LNCG settings from Rule 1, choose a setting from columns (k), (I) or (m) (whichever is allowable from Rule 1) which gives an N greater than H. If none of the choices meet the criterion, choose the highest value available.

(2) Check to see if the T value [from Table 3-18, column (n)] is greater than G. If N is less than or equal to H, or if T is less than or equal to G, proceed to Rule 3.

(3) If N is greater than H and T is greater than G, the LNCG setting chosen provides adequate nose lift and the bridge selected has adequate tail clearance, proceed to loads required.

TABLE 3-18. Rule 2 - DS 1 thru 12 Bay

Nose lift N, using various LNCG settings with FRB and RRB in low position				
2E + No. of Bays	Setting No.6 Yellow (k)	Setting No.4 Yellow (I)	Setting No.2 Yellow (m)	Tail Lift T (n)
1	1.02	1.48	2.04	0.55
2	0.89	1.53	2.30	
3	0.86	1.50	2.28	
4	0.81	1.45	2.23	
5	0.70	1.52	2.51	
6	0.65	1.48	2.47	0.52
7	0.53	1.36	2.36	
8	0.49	1.48	2.69	
9	0.33	1.35	2.55	0.46
10	0.25	1.28	2.49	
11	0.16	1.23	2.63	0.40
12	-0.20	1.02	2.47	

o. Rule 3

Raise both the FRB and RRB by 0.69 m as follows. Both roller beams are in the high position.

(1) Raise both the FRB and RRB by 0.69 m to increase nose clearance (N) [Table 3-19, column (o)] and tail clearance (T) [Table 3-19, column (p)].

N RULE 3 = N RULE 2 + 0.69 m

T RULE 3 = Value obtained from Table 3-19, column (p).

(2) If N Rule 3 is not greater than H and T Rule 3 is greater than G, proceed to Rule 4a., Table 3-20, column (q).

(3) If N Rule 3 is greater than H and T Rule 3 is not greater than G, proceed to Rule 4b., Table 3-20, column (r).

(4) If N Rule 3 is greater than H and T Rule 3 is greater than G, the bridge has adequate nose and tail clearance for launching, proceed to loads required.

TABLE 3-19. Rule 3 - DS 1 thru 12 Bay

Raise FRB & RRB to high position (increase N and T by 0.69 m)		
2E + No. of Bays	N (o)	T (p)
1-4	N Rule3 = N Rule 2 + 0.69 m	1.24
5-7		1.21
8-10		1.15
11-12		1.09

p. Rule 4a

Lower RRB to low position (FRB is in high position).If there is ample tail clearance, some increase in N can be obtained by keeping the FRB in its highest position and lowering the FRB to its lowest position. The mathematical equation for this process is shown under Table 3-20, column (q). N Rule 4a. = N Rule 3 + value N calculated from the equation shown under Table 3-20, column (q).

q. Rule 4b

Lower FRB to low position (RRB is in high position). If there is ample nose clearance, some increase in T can be obtained by keeping the RRB in its highest position and lowering the FRB to its lowest position. The mathematical equation for this process is shown under Table 3-20 column (r).

T Rule 4b. = T Rule 3 + value T calculated from the equation shown under Table 3-20, column (r).

TABLE 3-20 Rule 4a and 4b - DS 1 thru 12 Bay

Rule 4a.		Rule 4b.
Lowering RRB to increase N (FRB in high)		Lowering FRB to increase T (RRB in high)
2E + # of Bays	N (q)	T (r)
1-4	1.75 (1.24 - G)	0.2 (in Rule 3 - H)
5-7	1.75 (1.21 - G)	
8-10	1.75 (1.15 - G)	
11-12	1.75 (1.09 - G)	

r. Loads required

From Table 3-21, determine the truck and trailer loads required for the bridge.

TABLE 3-21. MGB Pallets DS

	No. of Bays			
Pallet Type	1 - 3	4-6	7- 9	10-12
Erection	1	1	1	1
Bridge	4	5	6	7
Total	5	6	7	8

NOTE

Additional vehicles are required to transport personnel. Erection pallets may be partial depending on the bridge being built.

s. Manpower and construction time

From Table 3-22, determine the manpower and construction time requirements.

TABLE 3-22. DS Working Parties and Building Times on Good Sites

	Double Story Single Span		
(a)	1-4 Bays (b)	5-8 Bays (c)	9-12 Bays (d)
Working party	1 + 24	1 + 24	1 + 24
Time by day(hours)	¾	1	11/2
Time by night (hours)	1 ¼	1 ½	2

NOTES:

1. All timings exclusive of work on approaches.
2. Add 20 percent for unskilled personnel.
3. Add 30 percent for inclement weather.
4. Add 30 percent for adverse site conditions.

t. Final design

During the preceding design process, the information necessary to fill in the blanks below would have been obtained. Fill in these figures in the pro-forma, at this point the design is considered complete.

a. 2E + _____ Bays b. LNCG Setting _____

c. FRB Setting _____ d. RRB Setting _____

d. Bearing : NB _____ FB _____ e. Truck/Trailer Loads _____

f. Manpower Required _____ g. Time to Construct _____

3-15 DOUBLE STORY 2E + 1 thru 2E + 12 BAY DESIGN ON RESTRICTED SITES

The design procedures for DS bridges (2E + 1 through 2E + 12 bay) on restricted sites is the same as for normal sites except that:

a. The length of the launching nose is increased by one or two launching nose heavy (LNH) sections. The decrease in the amount of R Distance required by increasing nose length can be seen in Table 3-23 below.

b. During construction, the number of times that the bridge is boomed will be increased, and the distance of each boom will be decreased.

NOTE

The distance for construction behind the FRB cannot be less than 9.1 m. If a vehicle and push bar are needed to boom a bridge, add 11.3 m to R Distance given.

TABLE 3-23. Effect of increasing nose length (DS bridges) on R distance

No. of LNH Added	R Distance Length of Bridge: 2E + No. of Bays											
	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	11 m	12 m
0	10.1	11.9	12.2	13.1	14.9		15.8	16.8	17.7	19.5	20.4	21.6
1	9.1					11.0	12.8		14.6	16.5		
2	No Advantage					9.1	11.0		12.8			14.6

3-16 DOUBLE STORY 2E + 13 thru 2E + 22 BAY DESIGN w/o LRS

The procedures that follow are for designs of DS 2E + 13 through 2E + 22 Bay MGBs (wo/LRS) on normal sites only where water level or any obstructions are at least 2.7 m below bank heights.

a. Measure the AR Gap (para.. 3-10a)

b. Select a bridge (para. 3-10b and Table 3-24)

TABLE 3-24. DS MGB 2E + 13 through 2E + 22 bays (w/o LRS)

AR Gap Ranges (a)	MLC* (b)	2E + No. of Bays (c)	Bridge Length L (d)	R Distance (e)	Nose Const (f)
28.3 - 30.9	60(T)	13	32.9	27.7	6N1
30.2 - 32.8	50	14	34.8	29.0	7N1
32.0 - 34.6	40	15	36.6	29.0	
33.8 - 36.4	40	16	38.4	29.6	
35.6- 38.2	30	17	40.2	29.6	8N1
37.5 - 40.1	30	18	42.1	29.6	8N1
39.3 - 41.9	24	19	43.9	35.1	6N1 + 3N2
41.1 - 43.7	24	20	45.7	38.7	
43.0 - 45.6	20	21	47.6	38.7	
44.8 - 47.4	16	22	49.4	40.5	

* See step k. Slope Check and Table 1-1 for crossing restrictions. (T) = Tracked

c. Bridge length

Read and note the number of bays and bridge length, Table 3-24 columns (c) and (d).

d. R Distance

Read and note the R Distance, Table 3-24 column (e).

e. Nose configuration

Read and note the nose configuration, Table 3-24 column (f).

f. Key construction points

Identify, locate, and take elevations at the key construction points. These constructions points are explained below and shown in Figure 3-13.

(1) F Peg-Designates the location of the far bank end of bridge (outer edge of bankseat beam). Initially placed 0.6 m (minimum acceptable) from the A peg on the far bank. This 0.6 m, between the A and F pegs is the amount of bridge that will bear on the far bank, and is known as the far bank bearing.

(2) A Peg-Edge of firm ground on the far bank.

(3) A' Peg-Edge of firm ground on the near bank.

(4) AR Gap-The distance measured between the A and A' pegs. This is the actual gap to be spanned by the bridge.

(5) F' Peg-Designates the location of the near bank end of bridge (outer edge of bankseat beam). The distance (determined later), from the A' to F' peg is the amount of bridge that will bear on the near bank, known as near bank bearing. The minimum acceptable near bank bearing is 1.4 m.

(6) CRB Peg-Designates the position of the capsill roller beam (CRB). The distance from the A' peg to the center of the CRB can not be less than 0.9 m, and from the CRB to the F' peg can not be less than 0.5 m. The placement of the CRB is determined by using the length of bridge (L), AR Gap, far bank bearing, and bridge overhang (0.5 m) to obtain an X distance (from A' to CRB). Placement of the CRB in this manner will ensure minimum effort during the jack down operation.

(7) FRB Peg-Designates the position of the front roller beam (FRB). The distance from the CRB to the center of the FRB (measured center to center) must be 9.1 m.

(8) RRB Peg-Designates the location of the rear roller beam (RRB). It is placed 4.6 m from the FRB (measured center to center).

(9) O Peg-Marks the clear distance behind the capsill roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 3-24, column (e), behind the CRB peg.

g. Calculate bearing

The minimum and maximum bearings for all DS bridges are shown in the Table 3-25 and Figure 3-13.To calculate the actual locations of the F and F' pegs, the following procedure is used: Near bank bearing = bridge length (L) - (AR Gap + 0.6 m) Where: Bridge length is obtained from column (d) of Table 3-24. The AR Gap was measured in the first step of the design procedure. An assumption of 0.6 m is made at this point in the calculation sequence because this is in the minimum acceptable bearing allowed on the far bank.

TABLE 3-25. Bearings DS 13-22 Bay w/o LRS

Bearings	Near Bank	Far Bank
Minimum	1.4 m	0.6 m
Maximum	2.3 m	2.3 m

h. Check bearing

(1) If the near bank bearing is within the minimum and maximum bearing limits, it will not be necessary to shift the position of the F and F' pegs. The position will be initially determined, F peg 0.6 m from A peg and the F' peg will be placed the distance determined as near bank bearing measured from the A' peg.

(2) If the near bank bearing is more than the maximum bearing allowed (2.3 m), it will be necessary to shift the bearing.

i. Shift bearing

(1) Determine the amount of excess near bank bearing by subtracting the maximum bearing allowed from the amount calculated. At this point decide how to use the excess bearing as follows:

either

(a) Add the excess bearing to the initial far bank bearing (0.6 m).

or

(b) Add the initial far bank and near bank bearings together, then divide by 2, resulting in an equal amount of bearing on both banks.

or

(c) Add the initial far bank and near bank bearings together, then divide the total bearing as you see fit, as long as minimums are met and maximums are not exceeded.

(2) Regardless of what is done, the locations of the F, F', CRB, FRB, RRB and O pegs will change or shift on the site. The location of the A and A' pegs do not change, nor does the width of the AR Gap.

(3) There are situations that will result in the maximum bearings being exceeded on both banks, due to the overlaps of gaps and bridge lengths or by making an error in the deign process. When this occurs:

either

(a) Dig out the soil from the bank until the bearing area will be less than the maximum.

or

(b) Pack up (place timbers) under the end of bridge upon completion. This packing must provide enough bearing surface to equal the minimum bearing for the bridge.

j. Key construction points

Locate the key construction points on the site and take elevations as follows:

(1) Estimate or measure the elevations of the F, CRB, FRB, RRB, and O pegs. Convert the elevation of the CRB to Datum, 0.0 elevation.

(2) Convert the elevations of the F, CRB, RRB and O pegs, using the CRB as Datum. Elevations above the datum lines are positive, elevations below Datum are negative.

(3) Place the elevations on the pro-forma as shown in Figure 3-13.

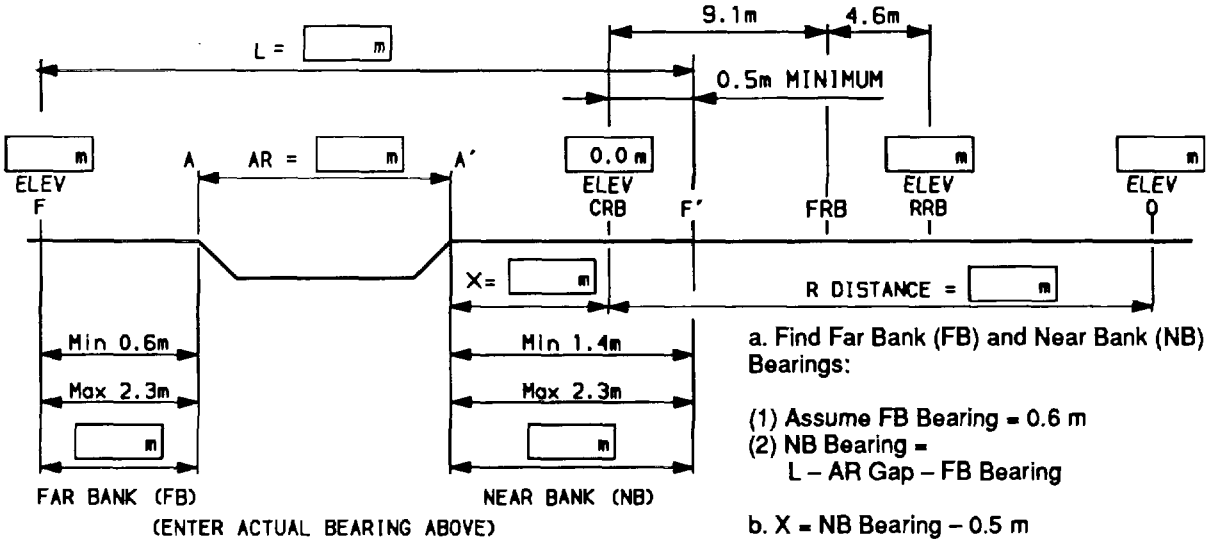


FIGURE 3-13 Site Profile DS 13-22 Bay w/o LRS

k. Slope check.

(1) Longitudinal: Ensure that the difference in elevation between the F' (use elevation of CRB) and F peg does not exceed 1/10 th of the total bridge length. If it does, either crib up, undertake a major construction project, or find another centerline.

(2) Transverse/cross: Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m), regardless of MLC.

I. Calculate H and G

Calculate the far bank height (H) and the ground (at tail of bridge) clearance (G) for later comparison against N (nose lift) and T (tail lift). The value of N, H, T and G are relative to a baseline drawn through the CRB and RRB.

$$H = \text{Elev F} + \frac{\text{Elev RRB x (L - 0.5m)}}{13.7\text{m}}$$

$$G = \text{Elev O} - \frac{\text{Elev RRB x R Distance}}{13.7\text{m}}$$

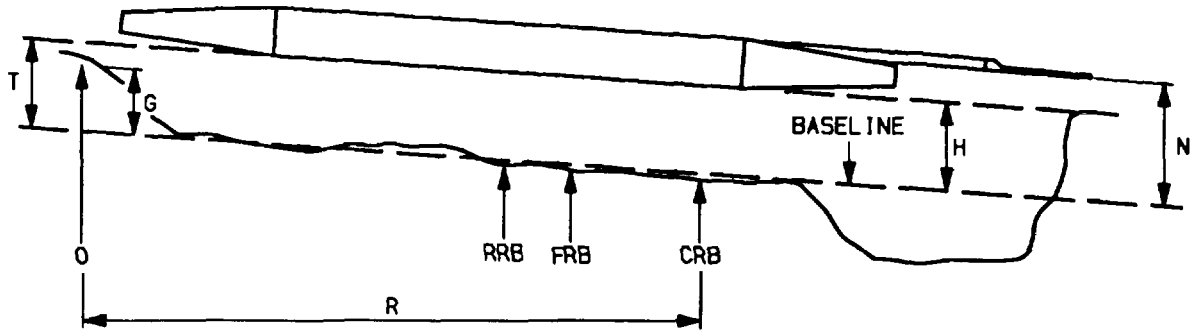


FIGURE 3-14. DS 13-22 BAY w/o LRS-Distance R,T,G,H,& N

m. Rule 1

Use a LNCG setting from Table 3-26, columns (g), (h) or (i). Both roller beams are in the low position.

(1) Choose a LNCG setting from Table 3-26, columns (g), (h), or (i) which gives an N greater than H. If none of the three choices meet the criteria, choose the highest value available.

(2) Check to see if the T value from Table 3-26, column () is greater than G.

(3) If N is less than or equal to H, or if T is less than or equal to G, proceed to Rule 2.

(4) If N is greater than H and T is greater than G, the LNCG setting chosen has adequate nose lift and the bridge selected has adequate tail clearance, proceed to loads required.

TABLE 3-26. Rule 1 - DS 13-22 Bay w/o LRS

Nose lift N with nose cross girder at:				
2E + No. of Bays	Setting No. 6 Yellow (g)	Setting No. 4 Yellow (h)	Setting No. 2 Yellow (h)	Tail Lift (T) (j)
13	- 0.07	1.49	2.68	0.40
14	- 0.38	1.00	2.65	0.37
15	- 0.49	0.90	2.55	0.34
16	- 0.61	0.79	2.43	0.30
17	- 0.15	0.75	2.69	0.27
18	- 1.33	0.54	2.54	0.21
19	- 2.04	- 0.19	1.72	
20	- 1.93	- 0.31	1.61	
21	- 2.65	- 0.52	1.17	0.18
22	- 2.58	- 0.68	1.04	0.15

n. Rule 2

Raise both the CRB and the RRB by 0.25 m as follows. Both roller beams are in the high position.

(1) Raise both the CRB and RRB by 0.25 m to increase nose clearance (N), see Table 3-27, column (k) and tail clearance (T), see Table 3-27, column (I).

(2) If N Rule 2 is greater than H and T Rule 2 is greater than G, the bridge has adequate nose and tail clearance for launching, proceed to loads required.

(3) If N Rule 2 is not greater than H and T Rule 2 is greater than G, proceed to Rule 3a., Table 3-28, column (m).

(4) If N Rule 2 is greater than H and T Rule 2 is not greater than G, proceed to Rule 3b, Table 3-28, column (n).

TABLE 3-27. Rule 2 - DS 13-22 Bay w/o LRS

Raise CRB and RRB by 0.25m			Raise CRB and RRB by 0.25m		
2E + No. of Bays	N (k)	T (l)	2E + No. of Bays	N (k)	T (l)
13	2.93	0.65	18	2.79	0.49
14	2.90	0.62	19	1.97	0.46
15	2.80	0.59	20	1.86	0.46
16	2.68	0.55	21	1.42	0.43
17	2.94	0.52	22	1.29	0.40

o. Rule 3a

Lower RRB to increase nose lift (N), (CRB is in the high position). If there is ample tail clearance, some increase in N can be obtained by keeping the CRB in its highest position and lowering the RRB to its lowest position. The mathematical equation for this process is shown under Table 3-28, column (m). N Rule 3a. - N Rule 2 + Value N calculated from the equation shown under Table 3-28, column (m).

p. Rule 3b

Lower CRB to increase tail clearance (T), (RRB is in the high position). If there is ample nose clearance, some increase in T can be obtained by keeping the RRB in the highest position and lowering the CRB to its lowest position. The mathematical equation for this process is shown under Table 3-28, column (n).

T Rule 3b. - T Rule 2 + Value T calculated from the equation shown under Table 3-28, column (n).

Table 3-28, column (n). Table 3-28. Rule 3a and 3b - DS 13-22 Bay w/o LRS

Rule 3a.		Rule 3b.
Lowering RRB to increase N		Lowering CRB to increase T
2E + # OF BAYS	N (m)	T (n)
13	1.9 (0.82-G)	0.2 (2.93H)
14	1.9 (0.79-G)	0.2 (2.90H)
15	1.9 (0.76-G)	0.2 (2.80H)
16	1.9 (0.72-G)	0.2 (2.68H)
17	1.9 (0.69-G)	0.2 (2.94H)
18	1.9 (0.66-G)	0.2 (2.79H)
19	1.9 (0.63-G)	0.2 (1.97H)
20	1.9 (0.63-G)	0.2 (1.86H)
21	1.9 (0.60-G)	0.2 (1.42H)
22	1.9 (0.57-G)	0.2 (1.29H)

q. Loads required

From Table 3-29, determine the truck and trailer loads required for the bridge.

Table 3-29. MGB Pallets DS 13-22 Bay w/o LRS

	No. of Bays			
Pallet Type	13-15	16-18	19-21	22
Erection *	1	1	1	1
Bridge	8	9	10	11
Total	9	10	11	12

* Increase quantity by one (1) if one pallet is loaded with additional erection components required from the LRS. Increase quantity by two (2) if complete LRS is used to obtain additional erection components required.

NOTE
Additional vehicles are required to transport personnel.

r. Manpower and construction time

From Table 3-30, determine the manpower and construction time requirements.

Table 3-30. Working Parties and Building Time on Good Sites - DS 13-22 Bay w/o LRS

		Double Story Single Span 13 - 22 Bays without LRS	
(a)	13 BAYS (b)	14 - 18 BAYS (c)	19 - 22 BAYS (d)
Working Party	1 + 24	1 + 24	1 + 24
Time by Day (hours)	1 1/2	1 3/4	2
Time by Night (hours)	2	2 ¾	3

NOTES:
1. All timings exclusive of work on approaches.
2. Add 20 percent for unskilled personnel.
3. Add 30 percent for inclement weather.
4. Add 30 percent for adverse site conditions.

s. Final Design

During the preceding design process, the information necessary to fill in the blanks below would have been obtained. Fill in these figures in the pro-forma, at this point the design is considered complete.

a. 2E +Bays _____ b. LNCG Setting _____

c. CRB Setting _____ d. RRB Setting _____

e. Bearing: NB _____ FB _____ f. Truck/Trailer Loads _____

g. Manpower Requirements _____ h. Time to Construct _____

3-17 DOUBLE STORY 2E+13 thru 2E+22 BAY DESIGN WITH LRS

The procedures that follow are for design of DS 2E + 13 through 2E + 22 bay MGBs (w/LRS) on normal sites where water level or any obstructions are at least 3.7 m below bank heights:

a. Measure the AR gap (para. 3-10a)
b. Select a bridge (para. 3-10b and Table 3-31)

Table 3-31. DS MGB Design13-22 Bays with LRS

Site and Bridge Dimensions					
AR GAP RANGES (a)	MLC* (b)	2E + No. of Bays (c)	Bridge Length L (d)	R Distance (e)	Nose Const (f)
28.3-30.9	70(T)	13	32.9	27.7	7N1
30.2-32.8	70(T)	14	34.8	29.0	7N1
32.0-34.1	70(T)	15	36.6	29.0	7N1
33.8-36.4	70(T)	16	38.4	29.6	8N1
35.6-38.2	70(T)	17	40.2	29.6	8N1
37.5-40.1	70(T)	18	42.1	29.6	6N1+3N2
39.3-41.9	70(T)	19	43.9	35.1	6N1+3N2
41.1-43.7	70(T)	20	45.7	38.7	6N1+3N2
43.0-45.1	70(T)	21	47.6	38.7	6N1+3N2
44.8-46.2	70(T)	22	49.4	40.5	6N1+3N2

* See step k. Slope Check and Table 1-1 for crossing restrictions and MLC 100(W) capability. (T) = Tracked

c. Bridge Length

Read and note the number of bays and bridge length, Table 3-31 columns (c) and (d).

d. R Distance

Read and note the R distance, Table 3-31 column (e).

e. Nose Construction

Read and note the nose configuration, Table 3-31 column (f).

f. Key Construction Points

Identify, locate and take elevations at the key construction points. These construction points are explained below and shown in Figure 3-15.

(1) F peg-Designates the location of the far bank end of bridge (outer edge of bankseat beam). Initially placed distance given as minimum bearing in Table 3-32 for the bridge being designed. The distance, between the A and F peg is the amount of bridge that will bear on the far bank, and is known as the far bank bearing.

(2) A peg-Edge of firm ground on the far bank.

(3) AR Gap-The distance measured between the A and A' pegs. This is the actual gap to be spanned by your bridge.

(4) A' peg-Edge of firm ground on the near bank.

(5) F' peg-Designates the location of the near bank end of bridge (outer edge of bankseat beam). The distance (determined later), from the A' to F' peg is the amount of bridge that will bear on the near bank, known as the near bank bearing. The minimum acceptable near bank bearing is 1.4 m.

(6) ex FRB peg-Designates the position of the ex front roller beam (ex FRB). The distance from the A' peg to the center of the ex FRB can not be less than 0.9 m, and from the ex FRB to the F' peg can not be less than 0.5 m. The placement of the ex FRB is determined by using the length of bridge (L), AR gap, far bank bearing, and bridge overhang (0.5 m) to obtain an X distance (from A' to CRB). Placement of the ex FRB in this manner will ensure minimum effort during the jack down operation.

(7) CRB peg-Designates the position of the capsill roller beam (CRB). The distance from the A' peg to the center of the CRB must be 2.7 m.

(8) FRB peg-Designates the position of the front roller beam (FRB) (measured center to center) must be 9.1 m.

(9) RRB peg-Designates the location of the rear roller beam (RRB). It is placed 4.6 m from the FRB (measured center to center).

(10) O peg-Marks the clear distance behind the capsill roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 3-31, column (e), behind the CRB peg.

g. Calculate bearing

The minimum and maximum bearings for all DS bridges with LRS are shown in the Table 3-32 and on Figure 3-15.3. To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing = bridge length (L) - (AR gap + See note below)

Where: Bridge length is obtained from column (d) of Table 3-31.
The AR gap was measured in the first step of this design procedure.

NOTE
Use minimum bearing from Table 3-32 for length and bridge being designed.

Table 3-32. Bearings

Minimums			Maximum
No. of Bays	Far Bank A to F	Near Bank A' to F'	Near/Far Banks
13, 14,16 thru. 20	0.6 m	1.4 m	2.3 m
15	1.1 m	1.4 m	2.3 m
21	1.14 m	1.4 m	2.3 m
22	1.6 m	1.6 m	2.3 m

h. Check bearing

(1) If the near bank bearing is within the minimum and maximum bearing limits, it is not necessary to shift the position of the F and F' pegs. The positions will be as initially determined, F peg (minimum from Table 3-32) from A peg and the F' peg will be placed the distance determined as near bank bearing measured from the A' peg.

(2) If the near bank bearing is more than the maximum bearing allowable (2.3 m), it will be necessary to shift the bearing.

i. Shift bearing

(1) Determine the amount of excess near bank bearing by subtracting the maximum bearing allowed from the amount calculated. At this point decide how to use the excess bearing as follows:

either

(a) Add the excess bearing to the initial far bank bearing (minimum from Table 3-32).

or

(b) Add the initial far bank and near bank bearings together, then divide by 2, resulting in an equal amount of bearing on both banks.

or

(c) Add the initial far bank and near bank bearings together, then divide the total bearing as you see fit, as long as minimums are met and maximums are not exceeded.

(2) Regardless of what is done, the locations of the F, F', CRB,FRB, RRB and O pegs will not change or shift on the site. The location of the A and A' pegs do not change, nor does the width of the AR Gap.

(3) There are situations that will result in the maximum bearings being exceeded on both banks, due to the overlaps of gaps and bridge lengths or by making an error in the deign process. When this occurs:

either

(a) Dig out the soil from the bank until the bearing area will be less than the maximum.

or

(b) Pack up (place timbers) under the end of bridge upon completion. This packing must provide enough bearing surface to equal the minimum bearing for the bridge.

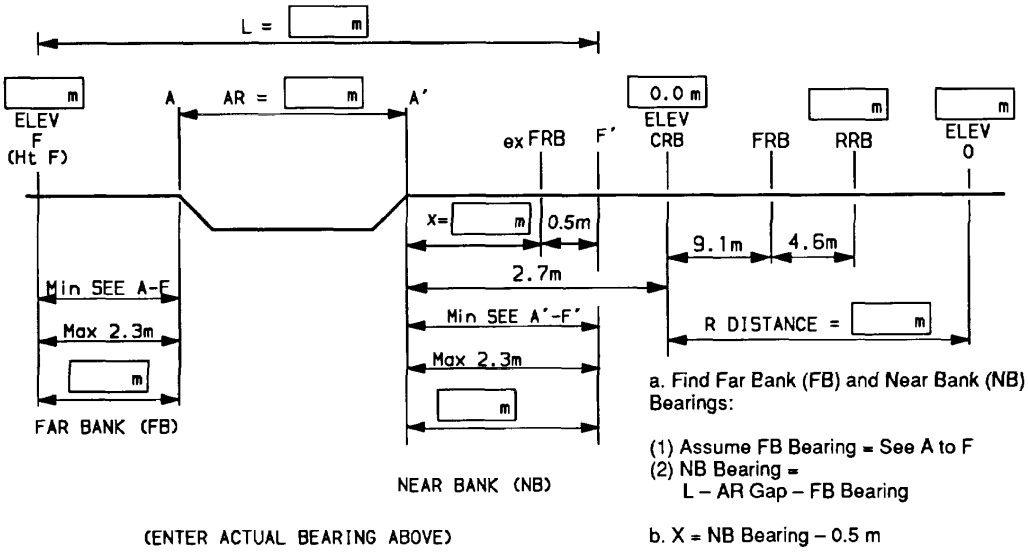
j. Key construction points

Locate the key construction points on the site and take elevations as follows:

(1) Estimate or measure the elevations of the F, CRB, FRB, RRB and O pegs. Convert the elevation of the CRB to datum, 0.0 elevation.

(2) Convert the elevations of the F, RRB and O pegs, using the CRB as datum. Elevations above the datum line are positive, elevations below datum are negative.

(3) Place the elevations on the pro-forma as shown in Figure 3-15.



No of Bays	Minimums	
	A to F	A' to F'
13, 14, 16 thru 20	0.6m	1.4m
15	1.1 m	1.4 m
21	1.14 m	1.4 m
22	1.6 m	1.6 m

FIGURE 3-15. Site Profile DS 13-22 Bay with LRS

k. Slope check.

(1) Longitudinal. Ensure that the difference in elevation between the F' (use elevation of CRB) and F peg does not exceed 1/20 th of the total bridge length. If it does, either crib up, undertake a major construction project, or find another centerline.

(2) Transverse/Cross. Ensure that the transverse slope on both banks does not exceed 1/20 th of the bridge width (4.0 m) for 13 - 20 bays at MLC 70(T) and 21 and 22 bays at MLC 60. No transverse slope is permitted for 21 and 22 bay at MLC 70(T) or any bridge at MLC 100(W).

I. Calculate H and G

Calculate the far bank height (H) and the ground (at tail of bridge) clearance (G) for later comparison against N (nose lift) and T (tail lift). The values of N, H, T and G are relative to a baseline drawn through the CRB and RRB.

$$H = \text{Elev F} + \frac{\text{Elev RRB} \times (L - 0.5\ \text{m})}{13.7\ \text{m}}$$

$$G = \text{Elev O} - \frac{\text{Elev RRB} \times \text{R distance}}{13.7\ \text{m}}$$

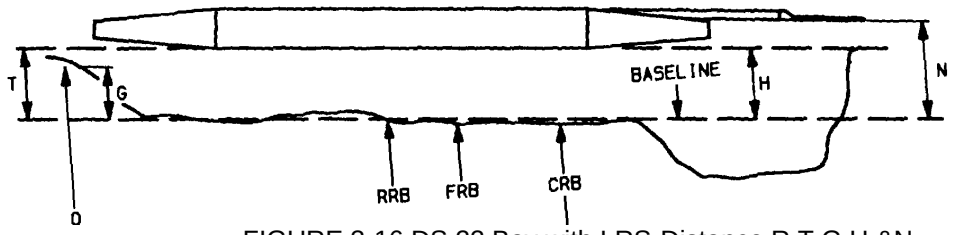


FIGURE 3-16 DS 22 Bay with LRS-Distance R,T,G,H &N

m. Rule 1

Use a LNCG setting to give adequate nose clearance (N) and tai clearance). See Table 3-33, column g), (h) or (i). Both roller beams are in the low position.

(1) Choose a NCG setting from Table 3-33, columns (g) (h) or (which give an N greater than H If none of these three choices meet the criteria. choose the highest value available.

(2) Check to see if the T value from Table 333, column (j) is greater than G.

(3) If N is greater than H or if T is not greater than G, proceed to Rule 2. If N is greater than H and T is greater than G the LNCG setting chosen has adequate nose lift and the bridge selected has adequate tail clearance proceed to loads required

Table 3-33. Rule 1 - DS 13-22 Bay with LRS

Nose Lift N with Nose Cross Girder at: (both CRB and RRB in high position)				
2E + No. of Bays	Setting No. 6 Yellow (g)	Setting No. 4 Yellow (h)	Setting No. 2 Yellow (i)	Tail Lift T (j)
13	0.48	1.87	3.52	0.40
14	0.31	1.72	3.35	0.37
15	0.25	1.64	3.29	0.34
16	-0.62	1.27	3.25	0.30
17	-0.77	1.12	3.10	0.27
18	-1.06	0.80	2.71	
19	-1.46	0.40	2.32	0.21
20	-1.75	0.11	2.03	
21	-2.08	0.05.	1.75	0.18
22	-2.44	-0.31	1.40	0.15

n. Rule 2.

Lower the RRB to increase N. If there is ample tail clearance, some increase in N can be obtained by keeping the CRB in its highest position and lowering the RRB to its lowest position. The mathematical equation for this process is shown under Table 3-34, column (k).

N Rule 2a. = N Rule 1 + Value N calculated from the equation shown under Table 3-34, column (k)

Table 3-34. Rule 2 - DS 13-22 Bay with LRS

2E + No. of Bays	Lowering RRB to increase N (k)
13	1.9 (0.82 - G)
14	1.9 (0.79 - G)
15	1.9 (0.76 - G)
16	1.9 (0.72 - G)
17	1.9 (0.69 - G)
18	1.9 (0.66 - G)
19 - 20	1.9 (0.63 - G)
21	1.9 (0.60 - G)
22	1.9 (0.57 - G)

o. Loads required

From Table 3-35, determine the truck and trailer loads required for the bridge.

NOTE
Additional vehicles are required to transport personnel.

Table 3-35. MGB Pallets DS 13-22 Bay with LRS

Pallet Type	No. of Bays			
	13 - 15	16 - 18	19 - 21	22
Erection	1	1	1	1
Bridge	8	9	10	11
Link	2	2	2	2
Total	11	12	13	14

p. Manpower and construction time

From Table 3-36, determine the manpower and construction time requirements.

Table 3-36. Working Parties and Building Time on Good Sites - DS 13-22 Bay with LRS

	Double Story Single Span 13-22 Bays w/LRS		
a	13 Bays (b)	14 - 18 Bays (c)	19 - 22 Bays (d)
Working Party	2 + 32	2 + 32	2 + 32
Time by Day (hours)	2	2 3/4	3
Time by Night (hours)	3	4	4 1/2

NOTES:
1. All timings exclusive of work on approaches.
2. Add 20 percent for unskilled personnel.
3. Add 30 percent for inclement weather.
4. Add 30 percent for adverse site conditions.

q. Final Design

During the preceding design process, the information necessary to fill in the blanks below would have been obtained. Fill in these figures in the pro-forma, at this point the design is considered complete.

a. 2E + _____ Bays _____ b. LNCG Setting _____

c. CRB Setting _____ d. RRB Setting _____

e. Bearing: NB _____ FB _____ f. Truck/Trailer Loads _____

g. Manpower Requirements _____ h. Time to Construct _____

r. Design Pro-Formas

This paragraph contains the design pro-formas, which are to be photocopied and used to record the final design information.

10. Loads required. From Table 3, determine the truck and trailer loads required for the bridge.

Truck/Trailer Loads

_____

11. Manpower and Construction time requirements. From Table 4, extract the following:

Manpower requirements

_____

Construction time

_____

12. Final Design.

a. No. of Bays _____

b. LNCG settings _____

c. Set up of RB _____

and Packing Required _____

d. Bearing: NB _____ FB _____

e. Truck/Trailer Loads _____

f. Manpower required _____

g. Time to construct _____

Table 3

MGB PALLETS SS				
Pallet Type	No. of bays			
	4–5	6–7	8–9	10–12
Erection	1	1	1	1
Bridge	1	2	3	4
Total	2	3	4	5

Note: Additional vehicles are required to transport personnel. Erection pallets may only be partial depending on the bridge being built.

Table 4

WORKING PARTIES AND BUILDING TIMES ON GOOD SITES.			
	SINGLE STORY SINGLE SPAN		
(a)	4–5 BAYS (b)	6–8 BAYS (c)	9–12 BAYS (d)
Working party	1 + 8	1 + 16	1 + 16
Time by day (hrs)	1/2	3/4	1
Time by night (hrs)	3/4	1	1 1/4

Notes:
1. All timings excl. of work on approaches.
2. Add 20% for unskilled personnel
3. Add 30% for inclement weather
4. Add 30% for adverse site conditions.

MGB DESIGN PROFORMA SS 4 THROUGH 12 BAYS

Grid _____ Recon Officer _____ Map ref. _____

Unit _____ MLC _____

1 **Measure AR Gap A to A'.** _____m
Apply to Table 1, column (a) & (b), (for MLC 30 thru 70) or Table 2, column (a) & (b), (for MLC 16 thru 24).

Note: Use Table 1 or Table 2 to obtain the answer to the following:

2. Select Bridge.
See column (c) _____ bays.

3. Bridge Length (L)
See column (d). _____ m.

4. R Distance.
See column (e) _____ m.

5. Nose Construction.
See column (f). _____ m

Table 1

SS BRIDGES 4 THRU 8 BAYS SITE AND BRIDGE DIMENSIONS					
AR Gap Ranges (a)	* MLC (b)	# of Bays (c)	Brg Lgth (d)	R Dist (e)	Nose Const (f)
3.7–7.1	70(T)	4	7.9	5.8	LLN ONLY
5.6–9.0	70(T)	5	9.8	6.7	
7.4–10.8	40	6	11.6	7.8	
9.2–12.6	30	7	13.4	9.5	
11.0–14.4	30	8	15.2	11.3	

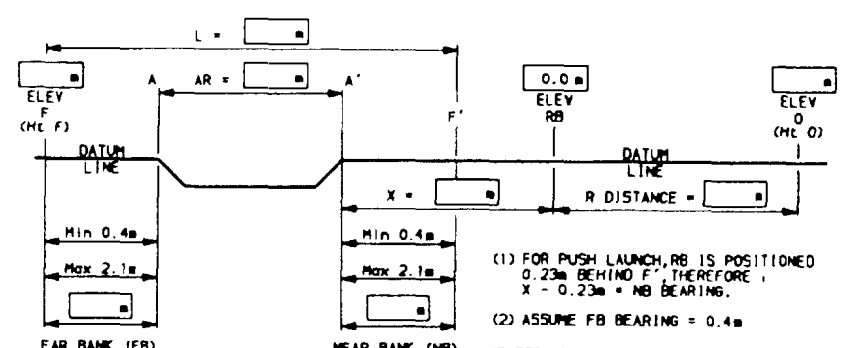
* = See step 7. Slope Check and Table 1–1 for max. crossings & MLC 100(W) capability.

Table 2

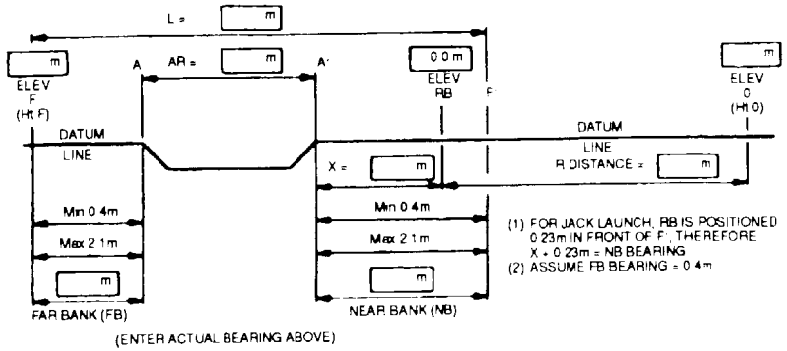
SS BRIDGES 9 THRU 12 BAYS SITE AND BRIDGE DIMENSIONS					
AR Gap Ranges (a)	MLC (b)	# of Bays (c)	Brg Lgth (d)	R Dist (e)	Nose Const (f)
12.9–16.3	24	9	17.1	10.4	5N1
14.7–18.1	20	10	18.8	12.2	5N1
16.5–19.9	16	11	20.7	12.2	6N1
18.4–21.8	16	12	22.6	14.0	6N1

6. Key Construction Points, Dimensions and Elevations.

a. Push launch. X = (L + 0.23m) – (AR Gap + 0.4m)



b. Jack Launch X = (L – 0.23 m) – (AR Gap + 0.4 m)



7. Slope Check. Longitudinal: Ensure that the difference in elevation between the F (use elevation of RB) and F peg does not exceed 1/10th of the total bridge length. If it does, you are going to have to crib up, undertake a major construction project, or find another centerline.

Transverse/Cross: Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m) for MLC 60 and below 1/20th of the bridge width (4.0 m) for MLC 61 and over. No transverse slope is permitted for MLC 100(W).

8. Calculate H. (for later comparison against N, see figure 1 below)

a. For Push Launch.

$$H = ElevF + \frac{ElevO \times (L + 0.23\ m)}{R\ Distance}$$

H = _____

b. For Jack Launch.

$$H = \frac{ElevF + ElevO \times (L - 0.23\ m)}{R\ Distance}$$

H = _____

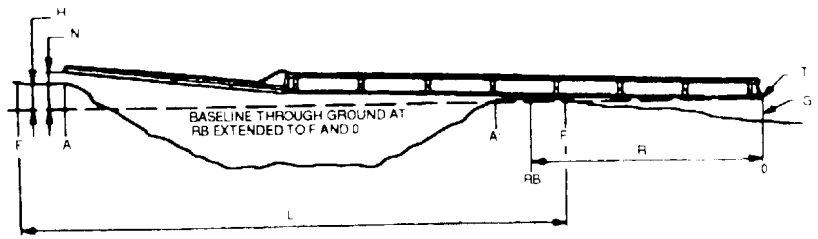


Figure 1 Single Story MGB Site Layout (4 through 12 bays)

9. Launch Design.

4 THRU 8 BAYS
(FROM TABLE 1 BELOW)
Choose a RB Set up and packing (if required) to give N>H RB Set up & Packing _____ (from columns g or h & Note 3)

9 THRU 12 BAYS
(FROM TABLE 2 BELOW)
Choose LNCG setting, RB Set up and packing (if required) to give N>H LNCG Setting _____ RB Set up & Packing _____ (from columns g through l & Note 3)

Table 1

NO OF BAYS	N, BP ONLY (g)	N, BP+DU** (h)
4	1.30	1.98
5	1.14	1.91
6	1.07	1.83
7	0.76	1.14
8	0.38	1.07

Table 2

SS BRIDGES 9 THROUGH 12 BAYS

Dimension N above line through ground at RB and O when rear BSB is on ground. The RB is set up on BP or BP & DU and LNCG is on setting #4, #2 or #1.

# of bays	LNCG Settings: #4 Black BP Only (g)	#4 Black BP+DU Only (h)	#2 Black BP Only (g)	#2 Black BP+DU Only (h)	#1 Black BP Only (g)	#1 Black BP+DU Only (h)
9	-0.76	0.15	0.61	1.37	1.83	2.59
10	-0.99	-0.38	0.38	0.90	1.60	2.21
11	-1.37	-0.84	0.15	0.71	1.83	2.67
12	-2.13	-1.37	0.46	0.31	1.07	1.83

Notes:

1. An extra 75 mm of clearance can be obtained by lifting the nose to take out the pin sag. Where levels are estimated, this should not be taken into account during the design, but left to compensate for any errors in calculating the value of H (for bridges 4 through 8 bays).

2. An extra 0.6 m of clearance can be obtained by lifting the nose to take out the pin sag (for bridges 9 through 12 bays).

3. Any additional packing under the RB will increase the vertical interval N by three times the thickness of the packing: such as, if the packing is 75 mm thick, N will be increased by 225 mm.

4. The Table incorporates an allowance to ensure that the nose clears the LR when it is positioned 230 mm in front of the F peg.

5. Height of the roller beam on baseplate only is 0.43 m height of baseplate, roller beam, and deck unit is 0.6 m.

** Plus 7.62 cm of timber packing between BP and DU.

12. RULE 4A. Lower RRB to low position. FRB is in high position.

N = N RULE 3 + answer to column (q).

N = _____ If N>H, go to Step 14.

13. RULE 4B. Lower FRB to low position. RRB high position.

T = T RULE 3 + answer to column (r).

T = _____ If T>G, go to Step 14.

14. Loads Required. From Table 2, determine the truck and trailer loads required for the bridge.

Truck/Trailer loads

_____

15. Manpower and Construction time requirement. From Table 3, extract the following.

Manpower requirements

_____

Construction time

_____

	Rule 4a	Rule 4b
	Lowering RRB to increase N	Lowering FRB to increase T
	(FRB in high)	(RRB in high)
2E + # of bays	N (q)	T (r)
1-4	1.75 (1.24-G)	0.2 (N RULE3-H)
5-7	1.75 (1.21-G)	
8-10	1.75 (1.15-G)	
11-12	1.75 (1.09-G)	

Table 2

MGB PALLETS DS				
Pallet Type	No. of bays			
	1-3	4-6	7-9	10-12
Erection	1	1	1	1
Bridge	4	5	6	7
Total	5	6	7	8

Note: Additional vehicles are required to transport personnel.

Table 3

WORKING PARTIES AND BUILDING TIMES ON GOOD SITES			
	DOUBLE STORY SINGLE SPAN		
	1-4 Bays	5-8 Bays	9-12 Bays
(a)	(b)	(c)	(d)
Working party	1 + 24	1 + 24	1 + 24
Time by day (hrs)	3/4	1	1 1/2
Time by night (hrs)	1 1/4	1 1/2	2

Notes:
1. All timings excl. of work on approaches.
2. Add 20% for unskilled personnel.
3. Add 30% for inclement weather.
4. Add 30% for adverse site conditions.

16. Final Design.

a. 2E + _____ Bays

b. LNCG setting _____

c. FRB setting _____

d. RRB setting _____

e. Bearing: NB _____ m FB _____ m

f. Truck and Trailer loads _____

g. Manpower required _____

h. Time to construct _____ hrs

MGB DESIGN PROFORMA DS 2E + 1 THROUGH 2E + 12 BAYS

GRID _____ RECON OFFICER _____ MAP REF _____

UNIT _____ MLC _____

Check Table 1, column (b).

1. Measure AR Gap A to A'. _____ m.
Apply to Table 1, column (a).

Note: Use Table 1 to obtain the answers to the following:

2. Select Bridge.
See column (c). 2E + _____ bays.

3. Bridge Length (L).
See column (d). _____ m.

4. R Distance.
See column (e). _____ m.

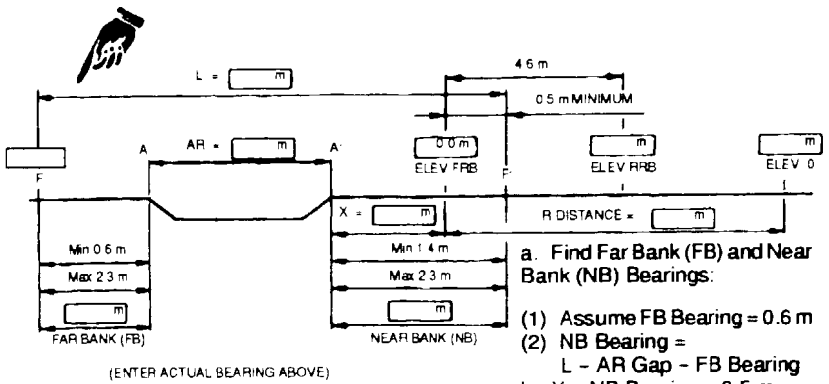
5. Nose Construction.
See column (f). _____

6. Key Construction Points, Dimensions, and Elevations.

Table 1

DS MGB DESIGN 2E + 1 THRU 2E + 12 BAYS					
SITE AND BRIDGE DIMENSIONS					
AR Gap Ranges (a)	MLC (b)	2E+# of bays (c)	Brg Lgth L (d)	R Dist (e)	Nose (f)
6.4-9.0	All MLC 70(T)	1	11.0	10.0	2N1
8.2-10.8		2	12.8	11.9	3N1
10.0-12.6		3	14.6	12.2	
11.9-14.5		4	16.5	13.1	
13.7-16.3		5	18.3	14.9	4N1
15.5-18.1		6	20.1	14.9	
17.3-19.9		7	21.9	15.8	
19.2-21.8		8	23.8	16.8	5N1
21.0-23.6		9	25.6	17.7	
22.8-25.4		10	27.4	19.5	
24.7-27.3		11	29.3	20.4	6N1
26.5-29.1		12	31.1	21.6	6N1

*See step 7. Slope check & Table 1-1 for max. crossings & MLC 100(W) capability.



a. Find Far Bank (FB) and Near Bank (NB) Bearings:

(1) Assume FB Bearing = 0.6 m
(2) NB Bearing =
L - AR Gap - FB Bearing

b. X = NB Bearing - 0.5 m

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MARINE CORPS TM 08761A-10/1-1

7. Slope Check. Longitudinal: Ensure that the difference in elevation between the F' (use elevation of FRB) and F peg does not exceed 1/10th of the total bridge length. If it does, you are going to have to crib up, undertake a major construction project, or find another centerline.

Transeverse/Cross: Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m) for MLC 60 and below 1/20th of the bridge width (4.0 m) for MLC 61 and over. No transverse slope is permitted for MLC 100(W).

8. **Calculate H, G and C** (for later comparison against N, T and D, see figures 1 and 2).

$$H = ElevF + \frac{ElevRRB \times (L - 0.5\ m)}{4.6\ m} \qquad H = \_\_\_\_\_$$

$$G = ElevO - \frac{ElevRRB \times R\ Distance}{4.6\ m} \qquad G = \_\_\_\_\_$$

$$C = ElevWL - \frac{Elev \times W\ Distance}{(L - 0.5\ m)} \qquad C = \_\_\_\_\_$$

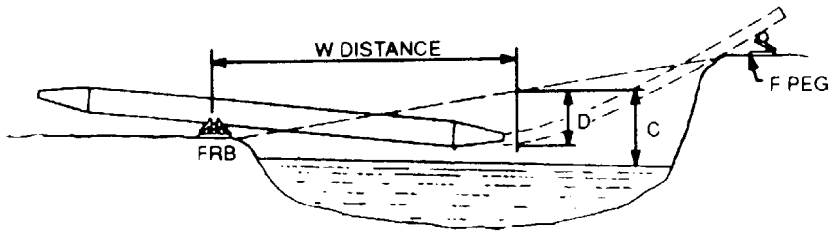


FIGURE 1. Deflection of DS MGB's

9. RULE 1. If **both** bank heights > 0.6 m, go to RULE 2. Both roller beams are in low position.
Choose a LNCG setting that ensures that the value of D (from FRB/F line to the point of maximum deflection), is greater than the depth of C (from FRB/F to WL).

LNCG setting permitted

_____

See columns (h), (i) and (j).

Note: If minor errors in level result in immersion less than 0.3 m in current speeds less than 5 m/s, it is not essential to adjust the launch setting.

RULE 1

2E + # of bays	W Dist (g)	D for given LNCG setting with FRB and RRB in low position: Setting #6 Yellow (h)	Setting #4 Yellow (i)	Setting #2 Yellow (j)
1–6	–	–	–	–
7	13.1	0.70	0.31	–0.09
8	15.0	0.67	0.25	–0.20
9	16.5	0.64	0.21	–0.30
10	17.6	0.60	0.12	–0.40
11	18.5	0.50	0.04	–0.43
12	19.2	0.46	–0.06	–0.58

10. RULE 2. Use a LNCG setting to give N>H and T>G. Both roller beams are in low position.
Choose a LNCG setting so that N>H.

LNCG setting chosen _____
See columns (k), (l) and (m)

N = _____ T = _____

Note; LNCG setting chosen cannot be numerically lower than that chosen in RULE 1.

If N≤H and/or T≤G, go to RULE 3.
If N>H and T>G, go to Step 14.

RULE 2

Nose lift N, using various LNCG settings with FRB and RRB in low position.				
2E + # of bays	Setting #6 Yellow (k)	Setting #4 Yellow (l)	Setting #2 Yellow (m)	Tail Lift T (n)
1	1.02	1.48	2.04	
2	0.89	1.53	2.30	
3	0.86	1.50	2.28	0.55
4	0.81	1.45	2.23	
5	0.70	1.52	2.51	
6	0.65	1.48	2.47	0.52
7	0.53	1.36	2.36	
8	0.49	1.48	2.69	
9	0.33	1.35	2.55	0.46
10	0.25	1.28	2.49	
11	0.16	1.23	2.63	0.40
12	–0.20	1.02	2.47	0.40

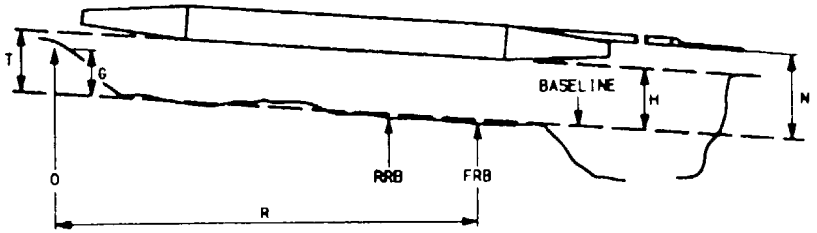


FIGURE2 Double Story MGB Site Layout (2E + 1 thru 2E + 12 bays).

11. RULE 3. Raise the FRB and RRB by 0.69m. Both roller beams are in high position.

N = N RULE 2 + 0.69 m N = _____

Check T>G - Yes/No col (p) T = _____

If N>H and T>G, design is OK, go to Step 14.

If N RULE 3≤H, go to Rule 4A.

If T RULE 3≤G, go to Rule 4B.

RULE 3

	Raise FRB & RRB to high position (increases N and T by 0.69 m)	
2E + # of bays	N (o)	T (p)
1–4	N RULE 3 =	1.24
5–7	N RULE 2 +	1.21
8–10	0.69 m	1.15
11–12		1.09

13. Loads required. From Table 2, determine the truck and trailer loads required for the bridge.

Truck/Trailer Loads

_____

14. Manpower and Construction time requirements. From Table 3, extract the following:

Manpower requirements

_____

Construction time

_____

15. Final Design.

a. 2E + _____ Bays

c. CRB setting _____

e. Bearing: NB _____ m FB _____ m

g. Manpower required _____

Table 2

MGB PALLETS DS without LRS				
Pallet Type	No. of bays			
	13–15	16–18	19–21	22
Erection*	1	1	1	1
Bridge	8	9	10	11
Total*	9	10	11	12

Note: Additional vehicles are required to transport personnel.
* = Increase quantity by one (1) if one pallet is loaded with additional erection components required from the LRS. Increase quantity by two (2) if complete LRS is used to obtain additional erection components required.

Table 3

WORKING PARTIES AND BUILDING TIMES ON GOOD SITES.			
	DOUBLE STORY SINGLE SPAN 13–22 BAYS without LRS.		
(a)	13 BAYS (b)	14–18 BAYS (c)	19–22 BAYS (d)
Working party	1 + 24	1 + 24	1 + 24
Time by day (hrs)	1 1/2	1 3/4	2
Time by night (hrs)	2	2 3/4	3

Notes:
1. All timings excl. of work on approaches.
2. Add 20% for unskilled personnel.
3. Add 30% for inclement weather.
4. Add 30% for adverse site conditions.

b. LNCG setting _____

d. RRB setting _____

f. Truck and Trailer loads _____

h. Time to construct _____ hrs

MGB DESIGN PROFORMA DS 2E + 13 THROUGH 2E + 22 BAYS
(without LRS)

Where water level or any obstructions are at least 2.7 m below bank heights.

GRID _____ RECON OFFICER _____ MAP REF _____

UNIT _____ MLC _____

1. Measure AR Gap A to A'. _____ m.
Apply to Table 1, column (a).

Check Table 1, column (b).

Note: Use Table 1 to obtain the answers to the following:

2. Select Bridge.
See column (c). 2E + _____ bays.

3. Bridge Length (L).
See column (d). _____ m.

4. R Distance.
See column (e). _____ m.

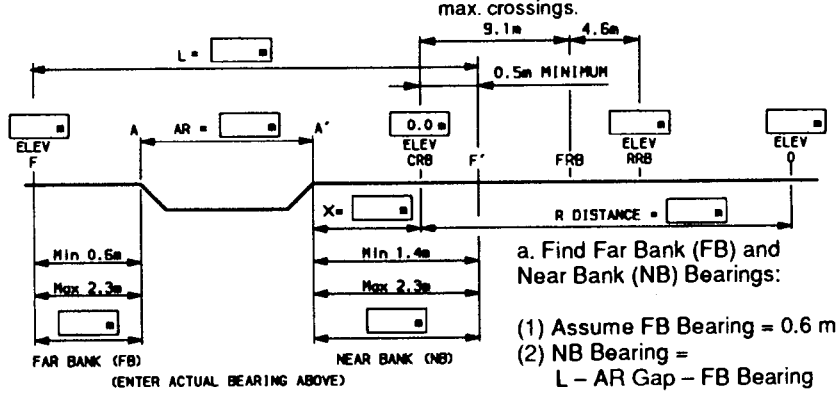
5. Nose Construction.
See column (f). _____.

6. Key Construction Points, Dimensions, and Elevations.

Table 1

DS MGB DESIGN 2E+13 THRU 2E+22 BAYS Without LRS					
SITE AND BRIDGE DIMENSIONS					
AR Gap Ranges (a)	* MLC (b)	2E+# of bays (c)	Brg Lgth L (d)	R Dist (e)	Nose Const (f)
28.3–30.9	60(T)	13	32.9	27.7	6N1
30.2–32.8	50	14	34.8	29.0	
32.0–34.6	40	15	36.6	29.0	7N1
33.8–36.4	40	16	38.4	29.6	
35.6–38.2	30	17	40.2	29.6	8N1
37.5–40.1	30	18	42.1	29.6	8N1
39.3–41.9	24	19	43.9	35.1	
41.1–43.7	24	20	45.7	38.7	6N1
43.0–45.6	20	21	47.6	38.7	+
44.8–47.4	16	22	49.4	40.5	3N2

* See step 7. Slope check & Table 1–1 for max. crossings.



a. Find Far Bank (FB) and Near Bank (NB) Bearings:

(1) Assume FB Bearing = 0.6 m
(2) NB Bearing =
L – AR Gap – FB Bearing
b. X = NB Bearing – 0.5 m

3D

3A

7. Slope Check. Longitudinal: Ensure that the difference in elevation between the F' (use elevation of CRB) and F peg does not exceed 1/10th of the total bridge length. If it does, you are going to have to crib up, undertake a major construction project, or find another centerline.

Transeverse/Cross: Ensure that the transverse slope on both banks does not exceed 1/10th of the bridge width (4.0 m), regardless of MLC.

8. **Calculate H and G.** (for later comparison against N and T, see Figure 1 below).

$$H = ElevF + \frac{ElevRRB \times (L - 0.5\ m)}{13.7\ m} \qquad H = \_\_\_\_\_$$

$$G = ElevO - \frac{ElevRRB \times R\ Distance}{13.7\ m} \qquad G = \_\_\_\_\_$$

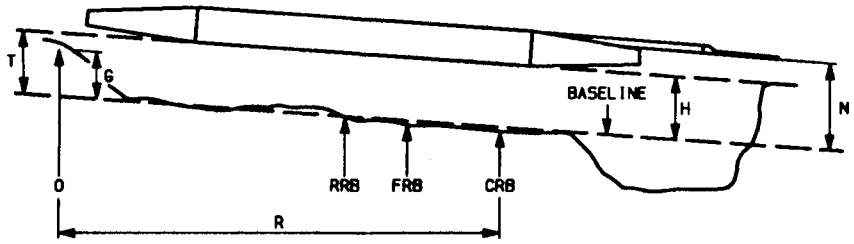


FIGURE 1. Double Story MGB (w/o LRS) Site Layout (2E+13 thru 2E+22 bays)

9. RULE 1. Use a LNCG setting to give N>H and T>G. Both CRB and RRB are in low position.

Choose a LNCGsetting so that N>H

LNCG setting chosen _____

See columns (g), (h) and (i)

N = _____ T = _____

If N≤H and/or T≤G, go to RULE 2.

If N>H and T>G, go to Step 13.

RULE 1

	Nose lift N with nose cross girder at:			
2E + # of bays	Setting #6 Yellow (g)	Setting #4 Yellow (h)	Setting #2 Yellow (i)	Tail Lift T (j)
13	–0.07	1.49	2.68	0.40
14	–0.38	1.00	2.65	0.37
15	–0.49	0.90	2.55	0.34
16	–0.61	0.79	2.43	0.30
17	–0.15	0.75	2.69	0.27
18	–1.33	0.54	2.54	0.21
19	–2.04	–0.19	1.72	
20	–1.93	–0.31	1.61	
21	–2.65	–0.52	1.17	0.18
22	–2.58	–0.68	1.04	0.15

10. RULE 2. Raise the CRB and RRB by 0.25 m. CRB and RRB are in high positions.

Check N>H. See column (k) N = _____

Check T>G. See column (l) T = _____

If N>H and T>G, design is OK, go to Step 13.

If N≤H, go to Rule 3A.

If T≤G, got to Rule 3B.

RULE 2

	Raise CRB and RRB by 0.25 m	
2E + # of bays	N (k)	T (l)
13	2.93	0.65
14	2.90	0.62
15	2.80	0.59
16	2.68	0.55
17	2.94	0.52
18	2.79	0.49
19	1.97	0.46
20	1.86	0.46
21	1.42	0.43
22	1.29	0.40

11. Rule 3A. Lower RRB. CRB is in high position.

N = N RULE 2 + answer to column (m).

N = _____.

If N>H, design is OK, go to Step 13.

12. RULE 3B. Lower RRB. CRB is in low position.

T = T RULE 2 + answer to column (n)

T = _____.

If T>G, design is OK, go to Step 13.

RULE 2

	RULE 3a	RULE 3B
	Lowering RRB to increase N	Lowering CRB to increase T
2E + # of bays	N (m)	T (n)
13	1.9 (0.82–G)	0.2 (2.93–H)
14	1.9 (0.79–G)	0.2 (2.90–H)
15	1.9 (0.76–G)	0.2 (2.80–H)
16	1.9 (0.72–G)	0.2 (2.68–H)
17	1.9 (0.69–G)	0.2 (2.94–H)
18	1.9 (0.66–G)	0.2 (2.79–H)
19	1.9 (0.63–G)	0.2 (1.97–H)
20	1.9 (0.63–G)	0.2 (1.86–H)
21	1.9 (0.60–G)	0.2 (1.42–H)
22	1.9 (0.57–G)	0.2 (1.29–H)

11. Loads Required. From Table 2, determine the truck and trailer loads required for the bridge.

Truck/Trailer Loads

_____

12. Manpower and Construction time requirements. From Table 3, extract the following:

Manpower requirements

_____

Construction time

_____

13. Final Design.

a. 2E + _____ Bays

c. CRB setting _____

e. Bearing: HB _____ m FB _____ m

g. Manpower required _____

Table 2

MGB PALLETS DS with LRS				
Pallet Type	No. of bays			
	13–15	16–18	19–21	22
Erection	1	1	1	1
Bridge	8	9	10	11
Link	2	2	2	2
Total	11	12	13	14

Note: Additional vehicles are required to transport personnel.

Table 3

WORKING PARTIES AND BUILDING TIMES ON GOOD SITES.			
	DOUBLE STORY SINGLE SPAN 13–22 BAYS with LRS.		
(a)	13 BAYS (b)	14–18 BAYS (c)	19–22 BAYS (d)
Working party	2 + 32	2 + 32	2 + 32
Time by day (hrs)	2	2 3/4	3
Time by night (hrs)	3	4	4 1/2

Notes:
1. All timings excl. of work on approaches.
2. Add 20% for unskilled personnel.
3. Add 30% for inclement weather.
4. Add 30% for adverse site conditions.

b. LNCG setting _____

d. RRB setting _____

f. Truck and Trailer loads _____

h. Time to construct _____ hrs

MGB DESIGN PROFORMA DS 2E + 13 THROUGH 2E + 22 BAYS (with LRS)

Where water level or any obstructions are at least 3.7 m below bank heights.

GRID _____ RECON OFFICER _____ MAP REF _____

UNIT _____ MLC _____

1. Measure AR Gap A to A'. _____ m.
Apply to Table 1, column (a).

Note: Use Table 1 to obtain the answers to the following:

2. Select Bridge.
See column (c). 2E + _____ bays.

3. Bridge Length (L).
See column (d). _____ m.

4. R Distance.
See column (e). _____ m.

5. Nose Construction.
See column (f). _____.

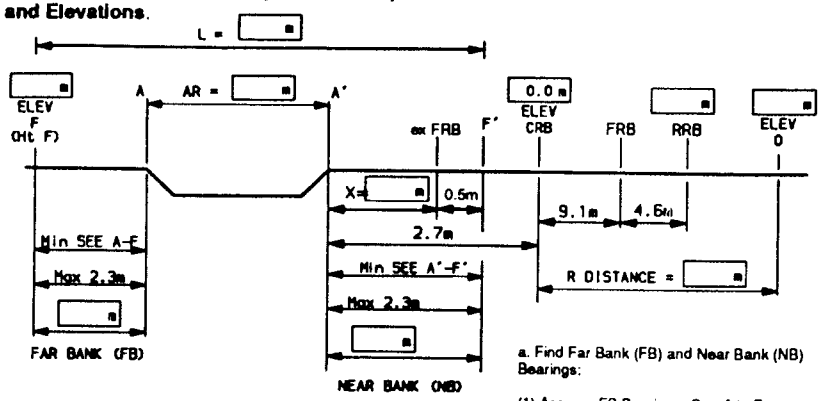
Check Table 1, column (b).

Table 1

DS MGB DESIGN 2E+13 THRU 2E+22 BAYS With LRS					
SITE AND BRIDGE DIMENSIONS					
AR Gap Ranges (a)	* MLC (b)	2E+# of bays (c)	Brg Lgth L (d)	R Dist (e)	Nose Const (f)
28.3–30.9	70(T)	13	32.9	27.7	7N1
30.2–32.8		14	34.8	29.0	
32.0–34.1		15	36.6	29.0	
33.8–36.4		16	38.4	29.6	8N1
35.8–38.2		17	40.2	29.6	8N1
37.5–40.1		18	42.1	29.6	6N1 + 3N2
39.3–41.9		19	43.9	35.1	
41.1–43.7		20	45.7	38.7	
43.0–45.1		21	47.6	38.7	
44.8–46.2		22	49.4	40.5	

* = See Step 7. Slope Check & Table 1–1 for max. crossings & MLC 100(W) capability.

6. Key Construction Points, Dimensions, and Elevations.



ENTER ACTUAL BEARING ABOVE)

a. Find Far Bank (FB) and Near Bank (NB) Bearings:

(1) Assume FB Bearing = See A to F
(2) NB Bearing =
L – AR Gap – FB Bearing

b. X = NB Bearing – 0.5 m

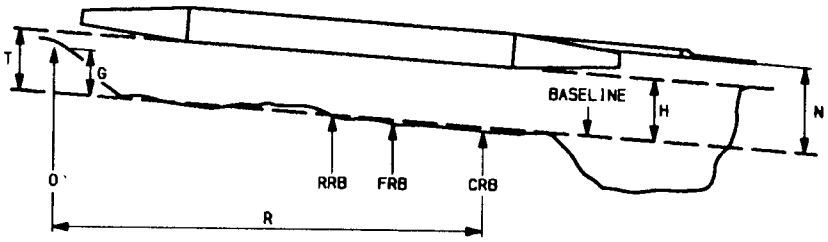
NO. OF BAYS	MINIMUMS	
	A TO F	A TO F'
13, 14, 16 THRU 20	0.6 m	1.4 m
15	1.1 m	1.4 m
21	1.14 m	1.4 m
22	1.6 m	1.6 m

7. Slope Check. Longitudinal: Ensure that the difference in the elevation between the F' (use elevation of CRB) and F peg does not exceed 1/20th of the total bridge length. If it does, you are going to have to crib up, undertake a major construction project, or find another centerline.
Transverse/Cross: Ensure that the transverse slope on both banks does not exceed 1/20th of the bridge width (4.0 m) for 13–20 bays at MLC 70(T) and 21–22 bays at MLC60. No slope permitted for 21–22 bay MLC70(T) or any bridge at MLC100(W).

8. Calculate H and G, (for later comparison against N and T).

$$H = ElevF + \frac{ElevRRB \times (L-0.5\ m)}{13.7\ m} \qquad H = \_\_\_\_\_$$

$$G = ElevO - \frac{ElevRRB \times R\ Distance}{13.7\ m} \qquad G = \_\_\_\_\_$$



Rule 1

9. RULE 1. Use a LNCG setting to give N>H and T>G. Both CRB and RRB are in high position.

Choose a LNCG setting so that N>H.

LNCG setting chosen _____
See columns (g), (h) and (i).

N = _____ T= _____

If N≤H, go to RULE 2.

If N>H, go to Step 11.

If T≤G, choose another site or prepare to dig out under NB end of bridge prior to launch.

Nose lift N with nose cross girder at: (both CRB and RRB in high position)				
2E + # of bays	Setting #6 Yellow (g)	Setting #4 Yellow (h)	Setting #2 Yellow (i)	Tail Lift T (j)
13	0.48	1.87	3.52	0.40
14	0.31	1.72	3.35	0.37
15	0.25	1.64	3.29	0.34
16	–0.62	1.27	3.25	0.30
17	–0.77	1.12	3.10	0.27
18	–1.06	0.80	2.71	0.21
19	–1.46	0.40	2.32	
20	–1.75	0.11	2.03	
21	–2.08	0.05	1.75	0.18
22	–2.44	–0.31	1.40	0.15

RULE 2

10. RULE 2. Lower RRB to the low position. CRB is in high position.

N = N RULE 1 + answer to column (k).

N = _____

If N>H, design is OK go to Step 11.

2E + # of bays	Lowering RRB to increase N (k)
13	1.9 (0.82–G)
14	1.9 (0.79–G)
15	1.9 (0.76–G)
16	1.9 (0.72–G)
17	1.9 (0.69–G)
18	1.9 (0.66–G)
19–20	1.9 (0.63–G)
21	1.9 (0.60–G)
22	1.9 (0.57–G)

Section V. TRANSPORT AND PALLETIZATION.

3-18 TRANSPORT REQUIREMENTS

All the components needed to build and launch MGB are transported to and from the bridge site on 5 ton dump trucks, and 4 ton 4 wheeltrailers. These vehicles are also used to transport personnel, supplies, material and other equipment when the bridge has been off loaded.

The quantity of components per bridge, basket loads per bridge and pallet loads per bridge/palletization, can be found in Appendix E.

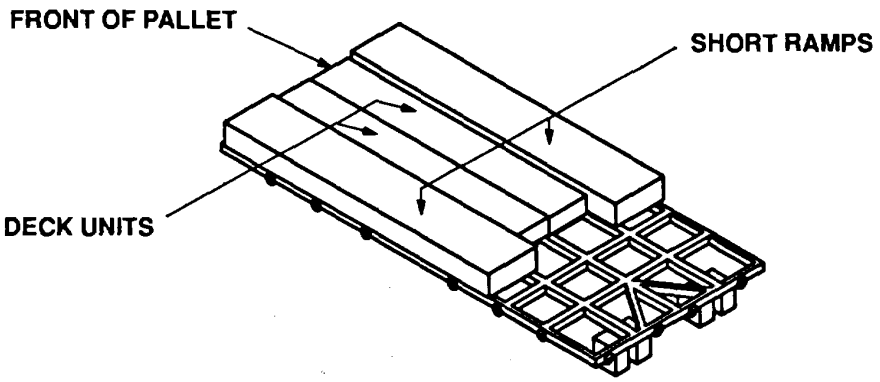
3-19 PALLETIZATION - SINGLE STORY

ABBREVIATIONS

SRDC - (Short Ramp, Deck and Curb). SRDC pallets carry short ramps, decks and curbs for single story bridges. There are nine variations, SRDC4 thru 12.
ES - (Erection Set). ES pallets carry the erection components for single story bridges. There are nine variations, ES4 thru 12. SSE - (Single Story End).
SSE pallets carry bankseat beams, top panels and deck units for each end of single story bridge. There are two variations, SSE and SSE6/8.
SSC - (Single Story Center). SSC pallets carry top panels and decks for the center of single story bridges.
There are five variations, SSC8 thru 12.

a. Pallet Load SRDC 4 through 12

(1) Place two deck units and two short ramps on front of pallet.
   (a) Front of deck units and ramps are placed flush with front of pallet.
   (b) Side of ramps are placed flush with edge of pallet.



SRDC 4 thru 12

FOR SRDC 4 PROCEED TO STEP (2).

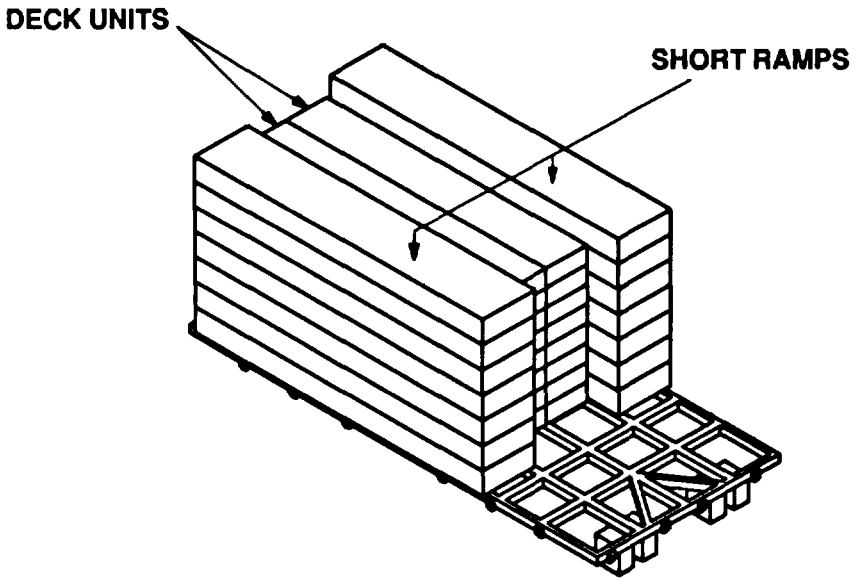
FOR SRDC 5 THRU 12 PROCEED TO STEP (5).

Pallet Load SRDC 4.

(2) Stack fourteen deck units (7 x 2) and twelve short ramps (6 x 2) on top of deck units and ramps placed on pallet in step (1).

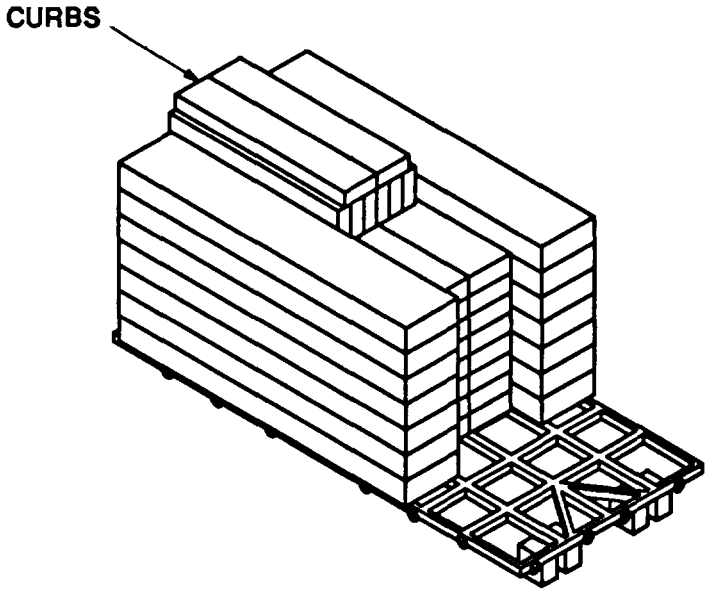
WARNING

Ensure that the deck units and ramps are stacked as neatly as possible using the stacking lugs and recesses for correct alignment. Improper stacking may result in Injury to personnel or damage to components.



SRDC 4

(3) Place eight curbs on top of deck units.



SRDC 4

(4) Secure load with nine 10,000 lb. cargo tie-down straps. Four lengthwise straps across pallet load and five crosswise straps.

(a) Place lengthwise straps across pallet load.

(b) The strap's ratchet assembly is placed to rear of pallet.

(c) Hook straps to shackles.

(d) Tighten straps.

(e) Place crosswise straps across pallet load.

(f) The strap's ratchet assembly is placed on right side of pallet.

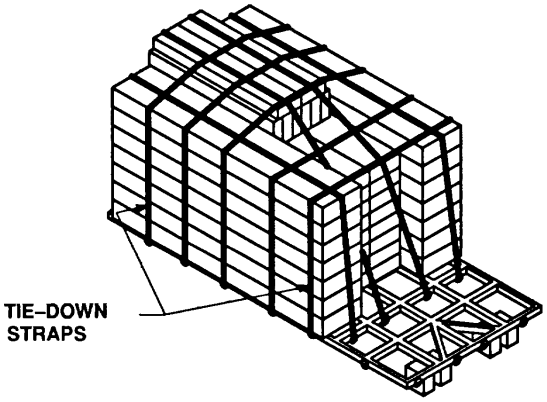
(g) Hook straps to shackles.

(h) Tighten straps.

(i) Tie rubber bumper across pallet load near rear of load.

NOTE

To unload the pallet, carry out the preceding steps In reverse order.



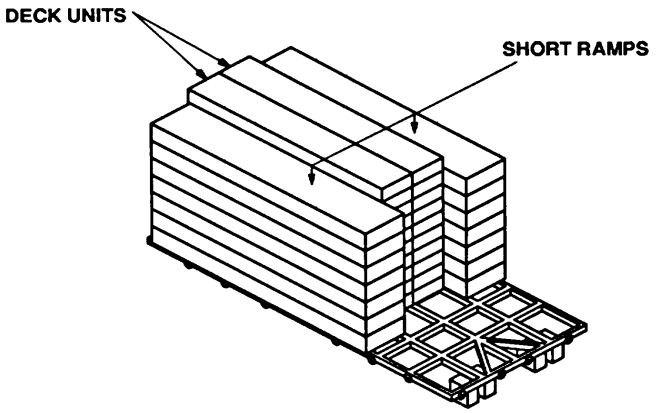
SRDC 4

Pallet Load SRDC 5 thru 12.

(5) Stack eighteen deck units (9 x 2) and twelve short ramps (6 x 2) on top of deck units and ramps placed on pallet in step (1).

WARNING

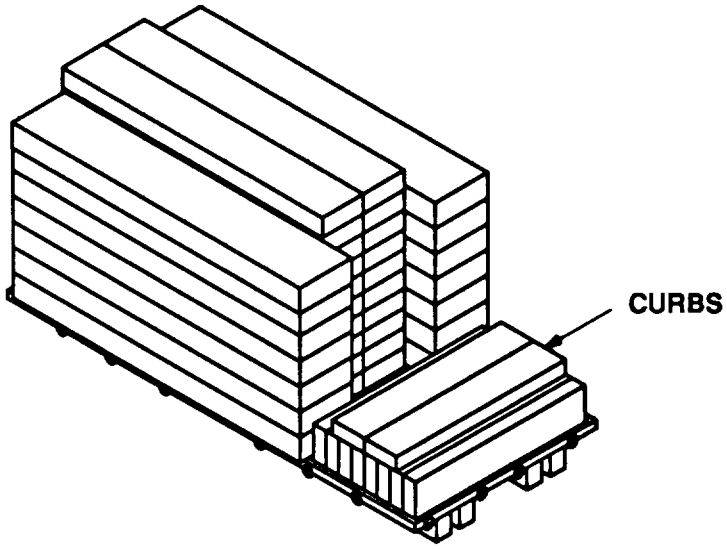
Ensure that the deck units and ramps are stacked as neatly as possible using the stacking lugs and recesses for correct alignment. Improper stacking may result In Injury to personnel or damage to components.



SRDC 5 thru 12

(6) Place required number of curbs across rear of pallet as illustrated. See list below for bridge configurations and curbs required for each one.

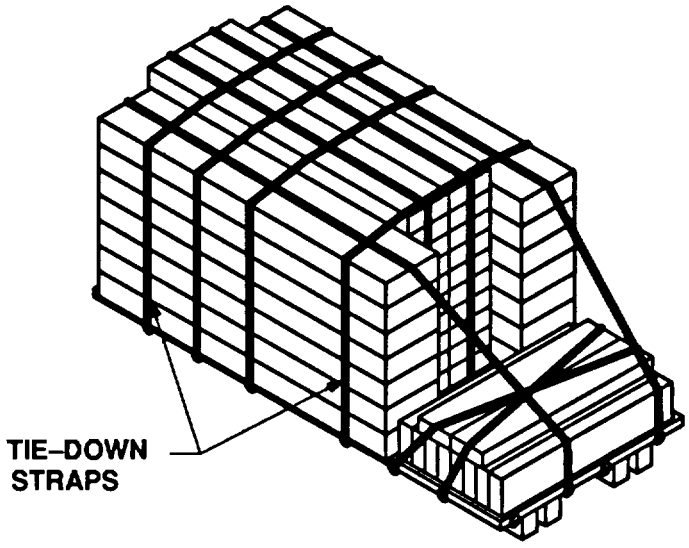
5 bay	10 curbs
6 bay	12 curbs
7 bay	14 curbs
8 bay	16 curbs
9 bay	18 curbs
10 bay	20 curbs
11 bay	22 curbs
12 bay	24 curbs



SRDC 5 thru 12

(7) Secure load with ten 10,000 lb. cargo tiedown straps as detailed in step (4)(a) to (i). Note that six "crosswise" straps are used for this load.

NOTE
To unload the pallet, carry out the steps In reverse order.

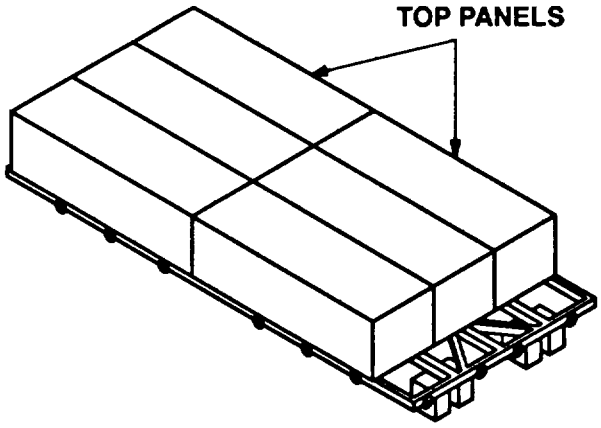


SRDC 5 thru 12

b. Pallet Load ES 4 thru 7/8

FOR ES 4, 5 AND 7/8 PROCEED TO STEP (1).
FOR ES 6 PROCEED TO STEP (2).

(1) Place six top panels on pallet as shown. Ensure that shoot bolts are placed in locked position after panels are butted together.

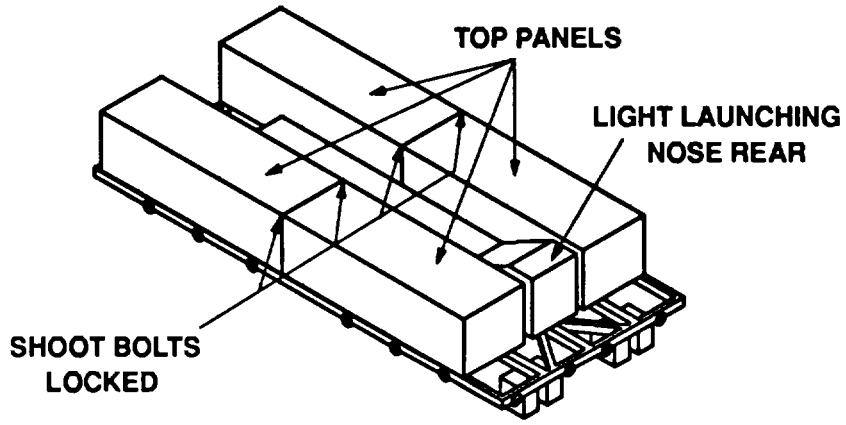


ES 4, 5, 7/8

FOR ES 4 PROCEED TO STEP (4).
FOR ES 5 PROCEED TO STEP (10).
FOR ES 7/8 PROCEED TO STEP (12).

Pallet Load ES 6.

(2) Place four top panels on pallet as shown. Ensure that shoot bolts are placed in locked position after panels are butted together. Use timber packing (3 in x 8 in x 36 in) between top panels and light launching nose rear to protect light launching nose side panels.



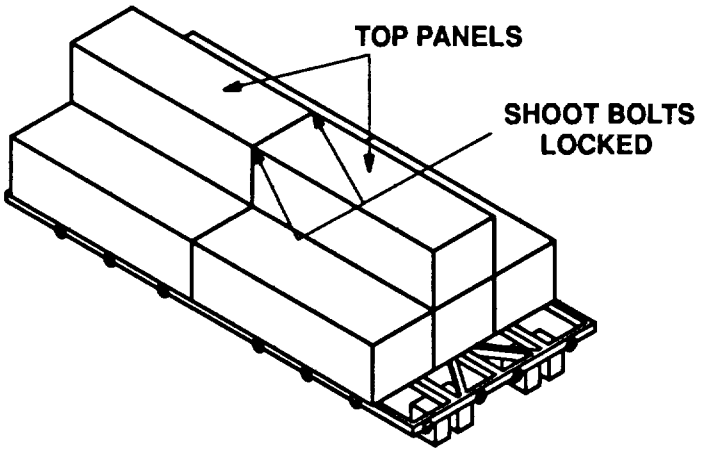
ES 6

(3) Place light launching nose rear section in space between top panels.

FOR ES6 PROCEED TO STEP (16).

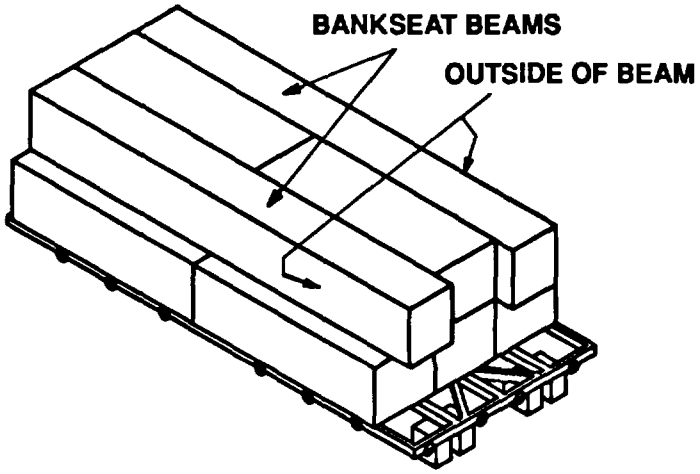
Pallet Load ES 4.

(4) Place two top panels on top of center two panels put on in step (1). Ensure that shoot bolts are placed in locked position.



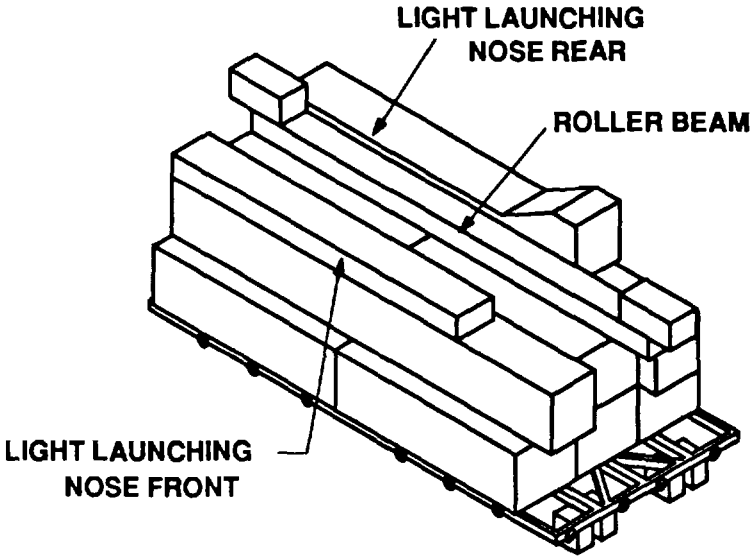
ES 4

(5) Place one bankseat beam on each side of the center top panels loaded in step (4). Ensure that the outside of the beam faces the outside of the load.



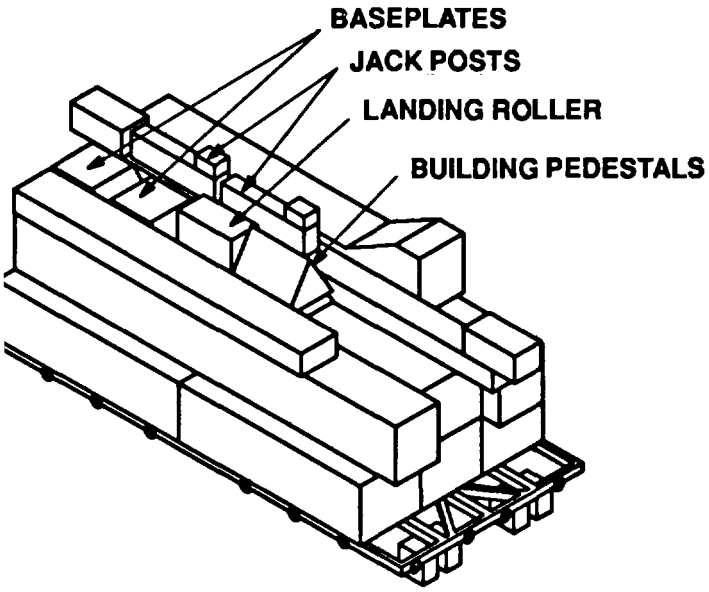
ES 4

(6) Place the following components on top of the load:
Light launching nose rear
Light launching nose front
Roller beam



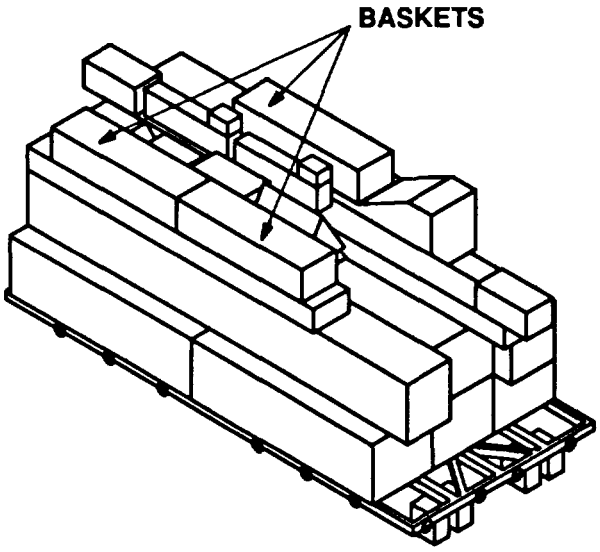
ES 4

(7) Place the following components on top of the load:
Two baseplates
Two building pedestals
One landing roller
Two jack posts
Two fixed supports (not shown)



ES 4

(8) Place three baskets on top of the nose sections



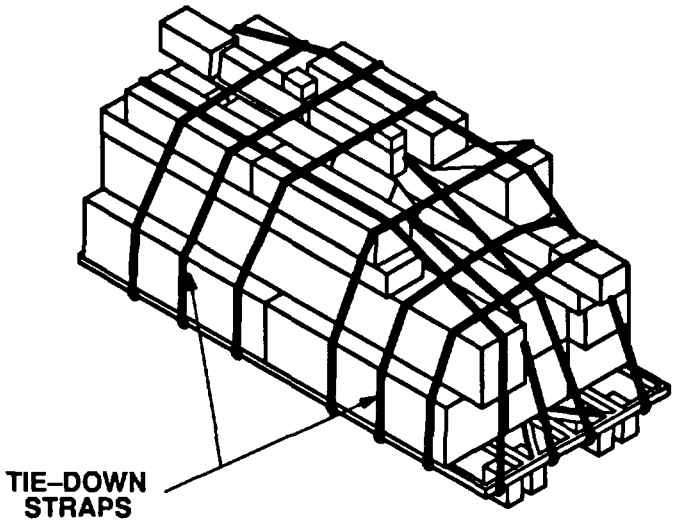
ES 4

(9) Secure load with ten 10,000 lb. cargo tie - down straps, (four lengthwise straps and six crosswise straps), as detailed in step a. (4)

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE
To unload the pallet, carry out the steps In reverse order.

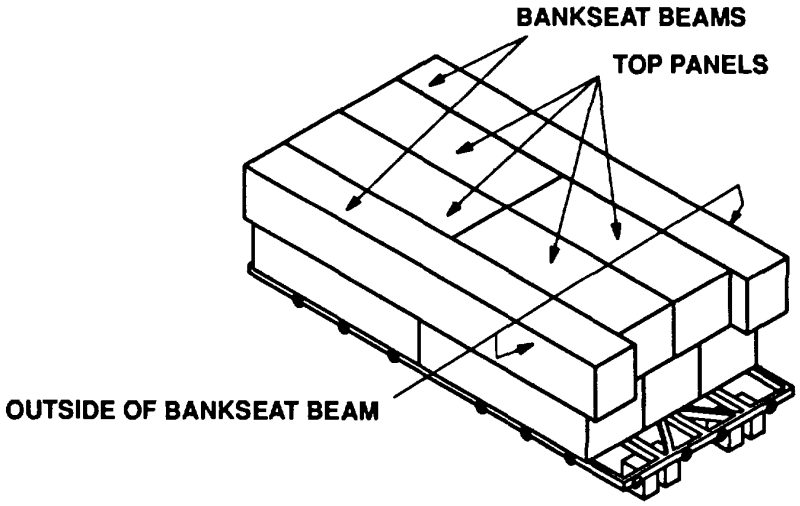


ES 4

Pallet Load ES 5.

(10) Place four top panels on top of load. Ensure that shoot bolts are locked after panels are butted together.

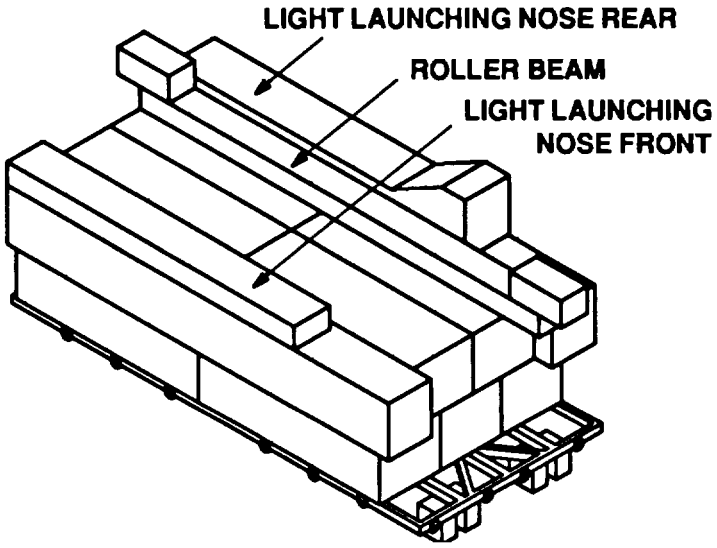
(11) Place one bankseat beam on each side of center top panels. Ensure that outside of beam faces outside of load.



ES 5

(12) Place the following components on top of the load:

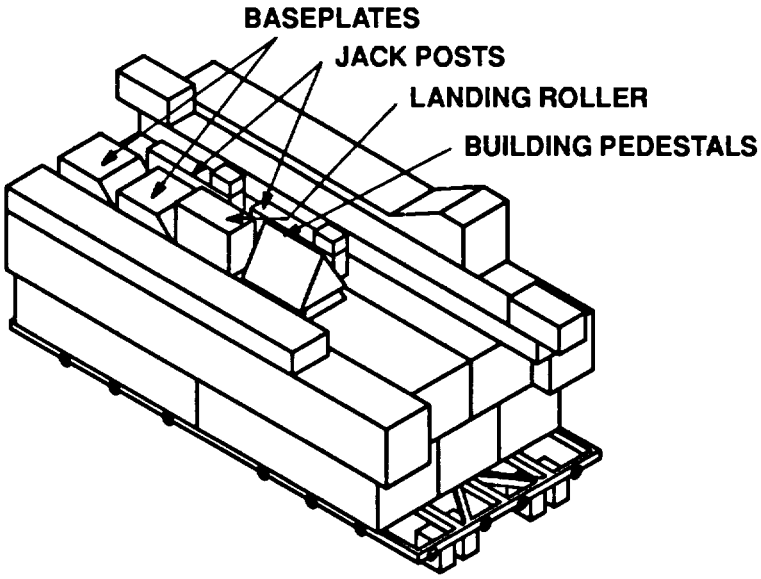
Light launching nose rear
Light launching nose front
Roller beam



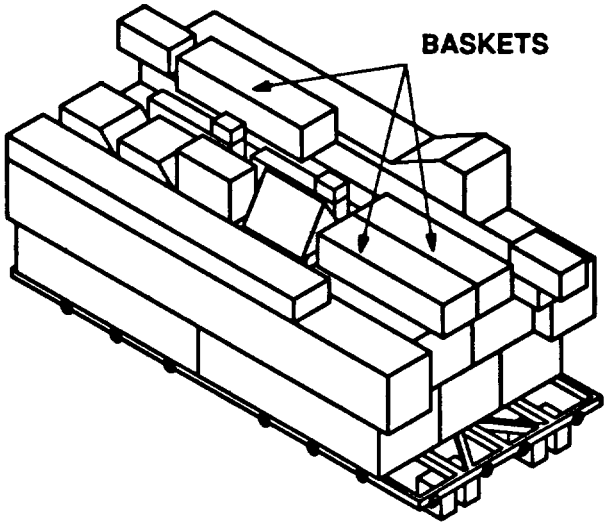
ES 5

(13) Place the following components on top of the load:

Two baseplates
Two building pedestals
One landing roller
Two jack posts
Two fixed supports (not shown)



ES 5



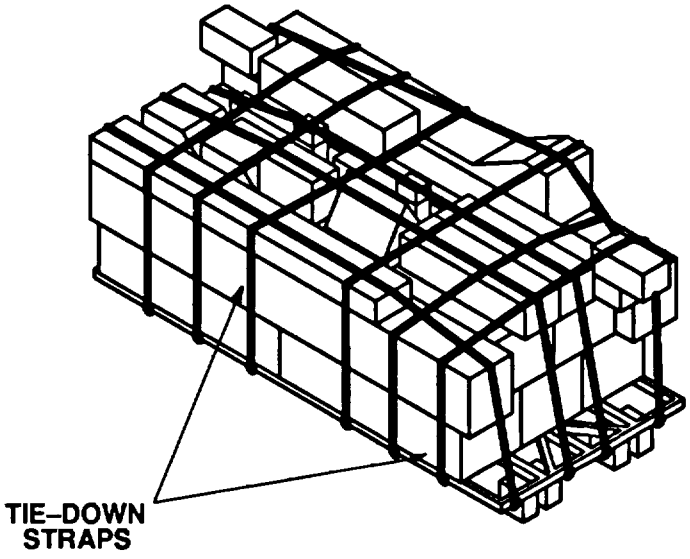
ES 5

(15) Secure load with ten 10,000 lb. cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE
To unload the pallet, carry out the steps in reverse order.

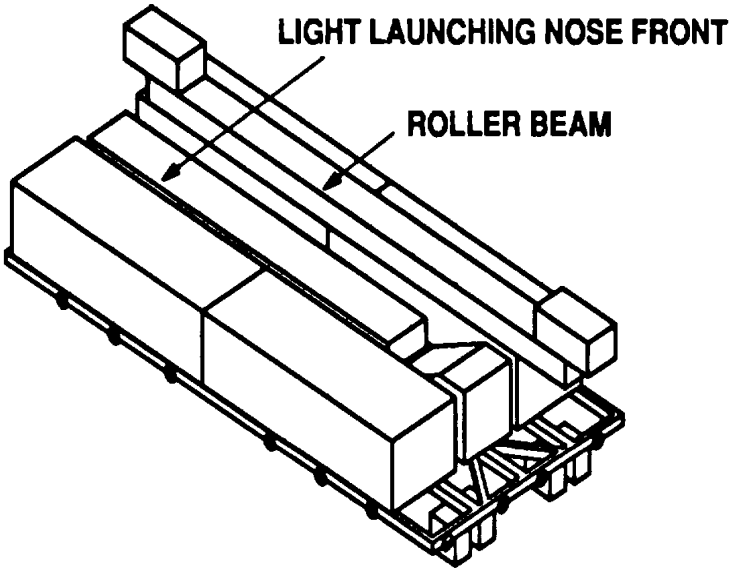


ES 5

Pallet Load ES 6.

(16) Place light launching nose front section on top of light launching nose rear.

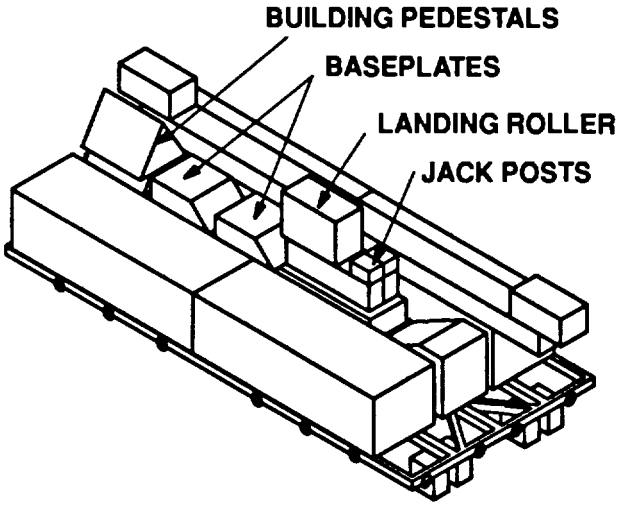
(17) Place roller beam on top of top panels on right side of load.



ES 6

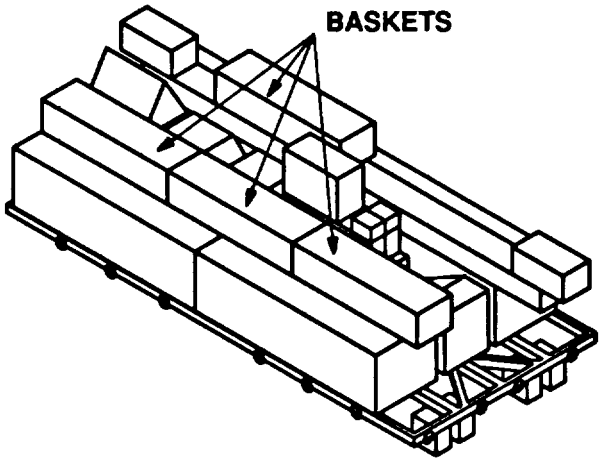
(18) Place the following components on top of the nose sections:

Two baseplates
Two building pedestals
One landing roller
Two jack posts
Two fixed supports (not shown)



ES 6

(19) Place four baskets on top of load.



ES 6

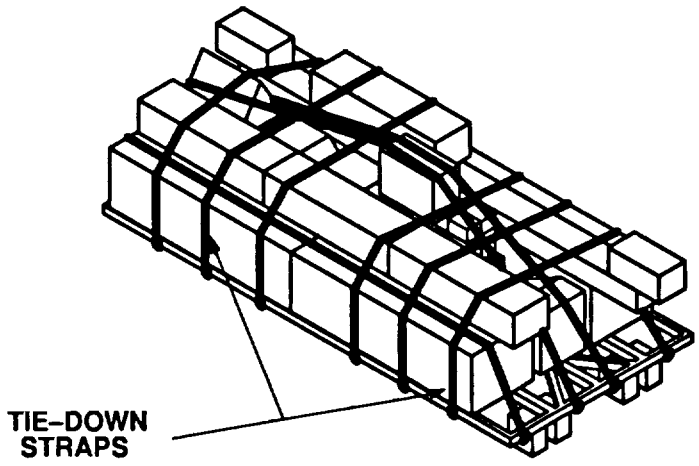
(20) Secure load with ten 10,000 lb. cargo tie-down straps, (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE

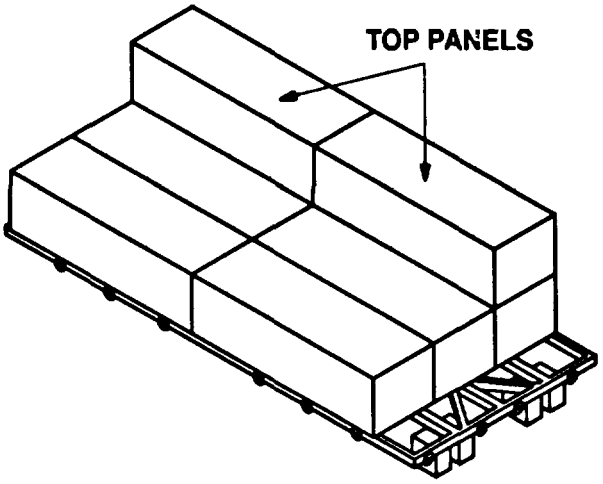
To unload the pallet, carry out the steps In reverse order.



ES 6

Pallet Load ES 7/8.

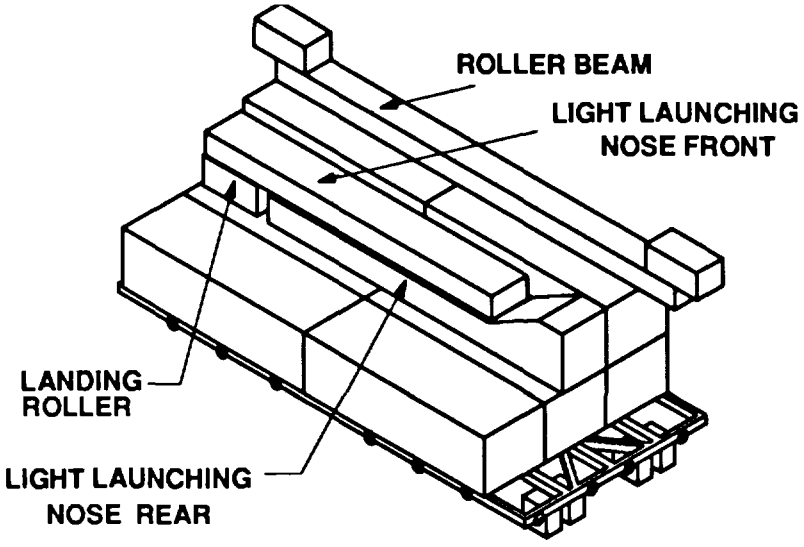
(21) Place two top panels on top of the panels on right side of load. Ensure that shoot bolts are placed in the locked position after panels are butted together.



ES 7/8

(22) Place the following components on top of the load:

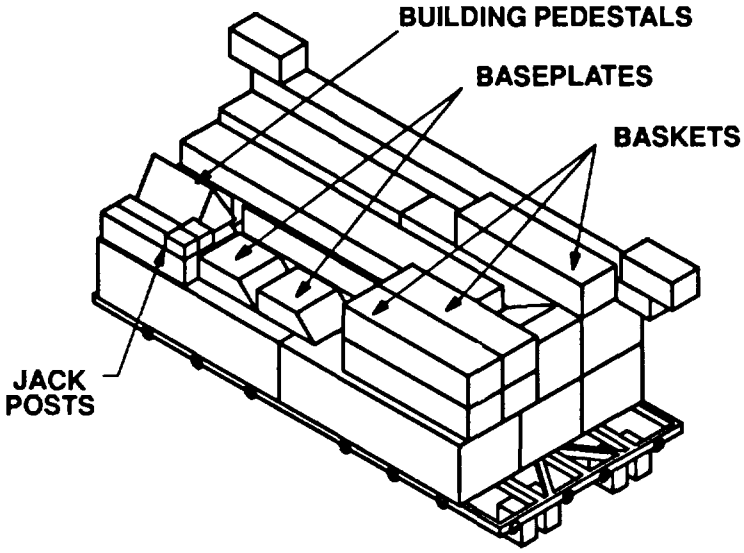
Light launching nose rear
Light launching nose front
Landing roller
Roller beam



ES 7/8

(23) Place the following components on top of the load:

Two baseplates
Two building pedestals
Two jack posts
Two fixed supports (not shown)



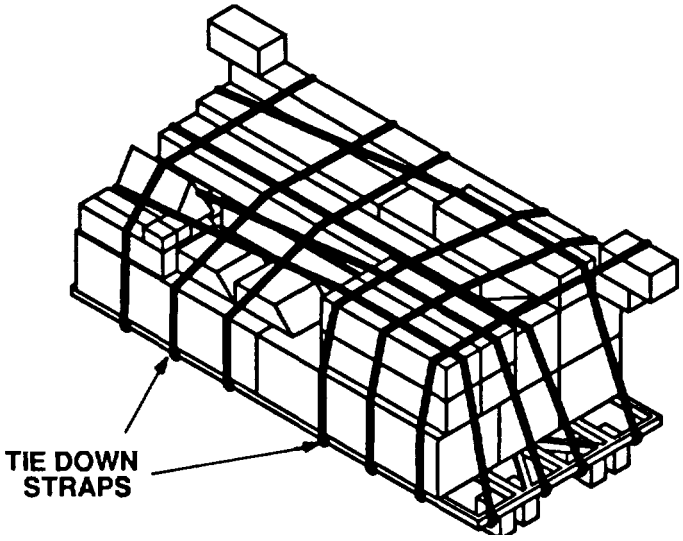
ES 7/8

(24) Secure load with ten 10,000 lb. cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE
To unload the pallet, carry out the steps In reverse order.



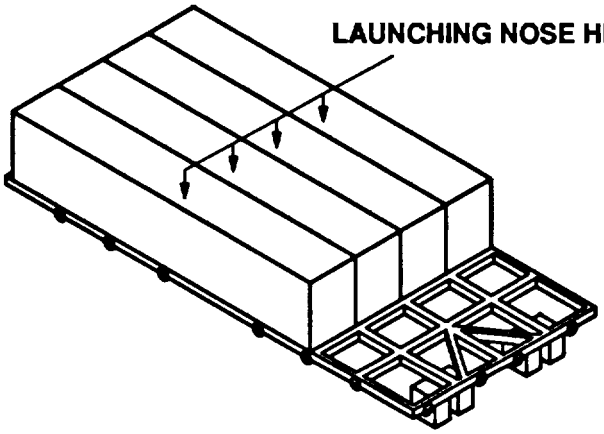
ES 7/8

c. Pallet Load ES 11/12

(1) Place four launching nose heavy sections across pallet.

(a) The front of nose sections are flush with front of pallet.

(b) Side of outer nose sections are flush with side of pallet.



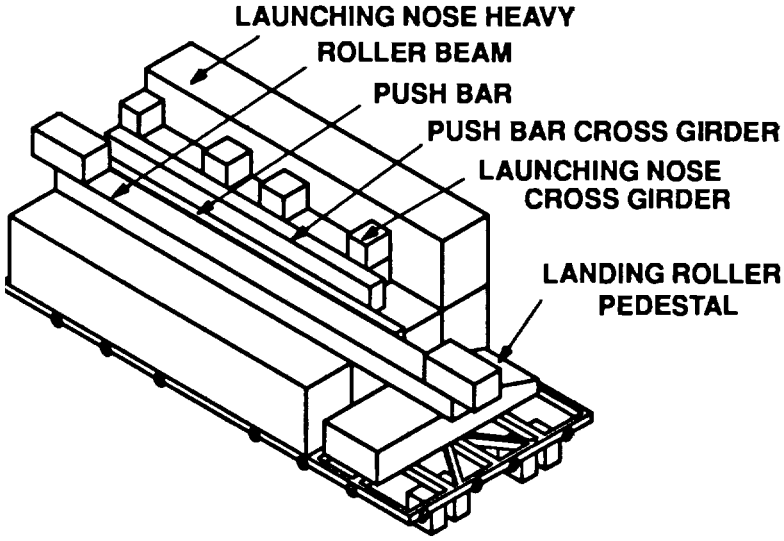
ES 11/12

(2) Place one launching nose heavy section on top of nose section on right side of pallet.

(3) Place one landing roller pedestal across rear of pallet behind nose sections.

(4) Place the following components on top of the nose sections:

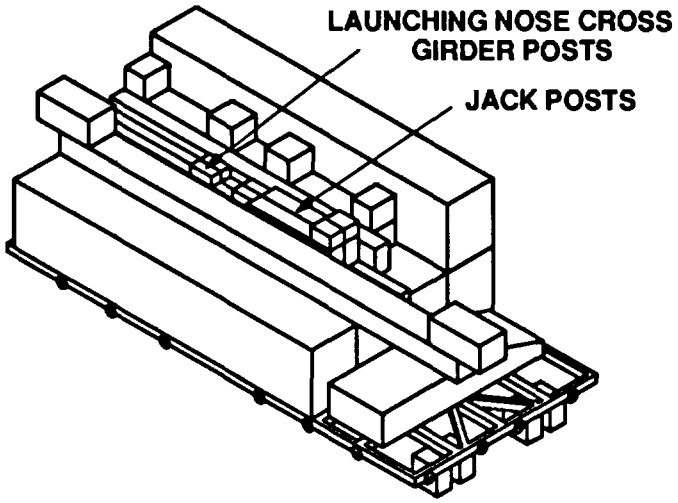
Roller beam
Push bar
Push bar cross girder
Launching nose cross girder.



ES 11/12

(5) Place the following components on the top of the load:

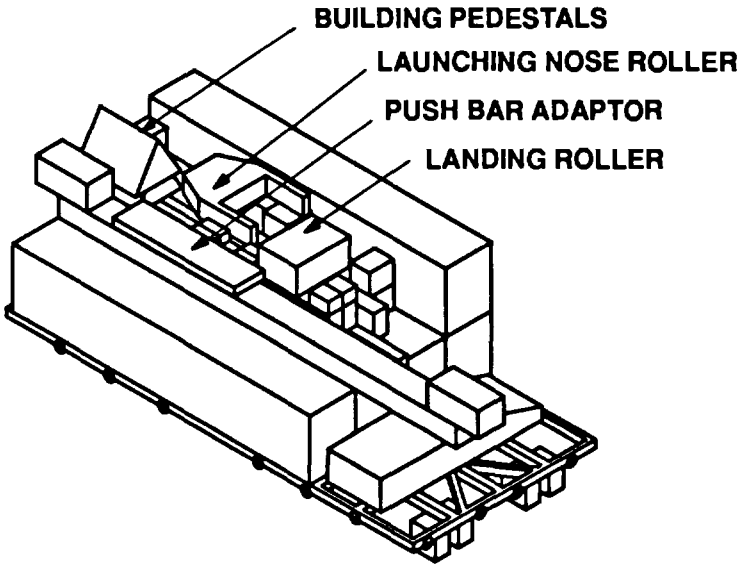
Two launching nose cross girder posts
Two jack posts



ES 11/12

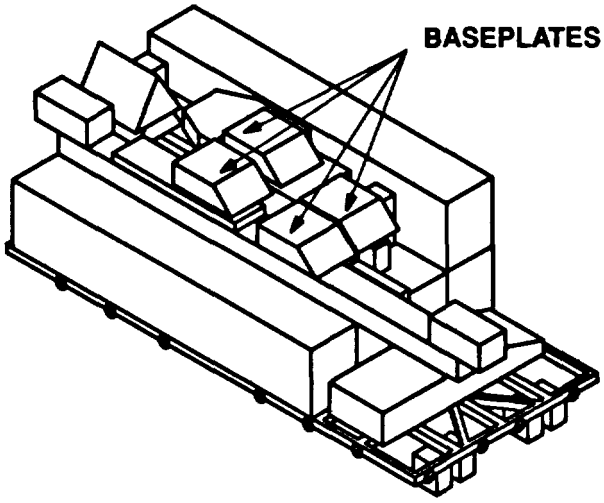
(6) Place the following components on the top of the load:

Push bar adapter
Two building pedestals
Landing roller
Launching nose roller



ES 11/12

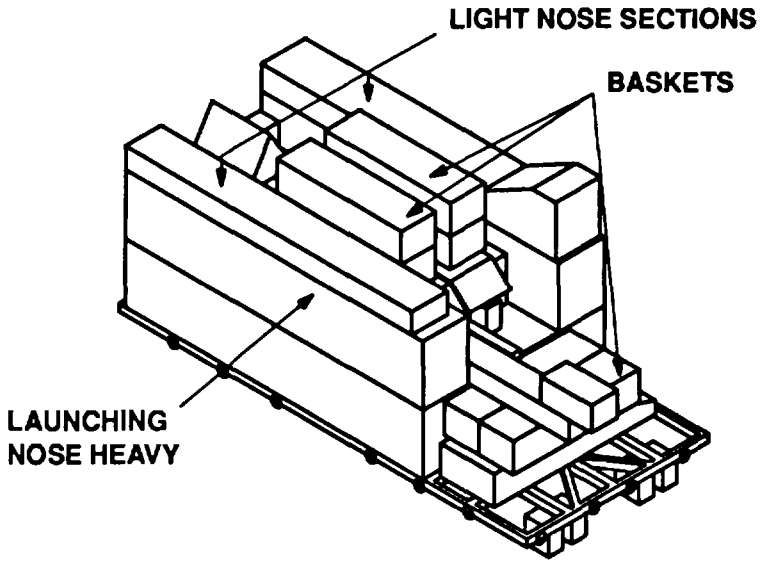
(7) Place four baseplates on top of load.



(8) Place one launching nose heavy section on top of nose section on left side of pallet.

(9) Place light nose sections on top of heavy nose sections.

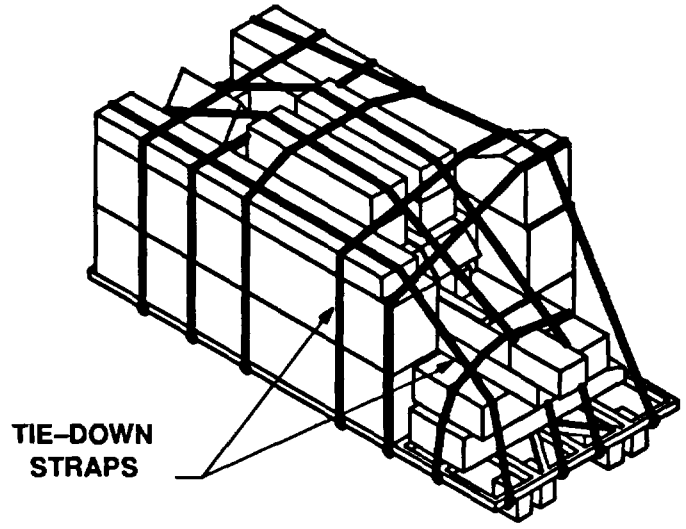
(10) Place six baskets on the load: four are placed on baseplates, two are placed on landing roller pedestal.



ES 11/12

(11) Secure load with ten 10,000 lb cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

NOTE
To unload the pallet, carry out the steps In reverse order.



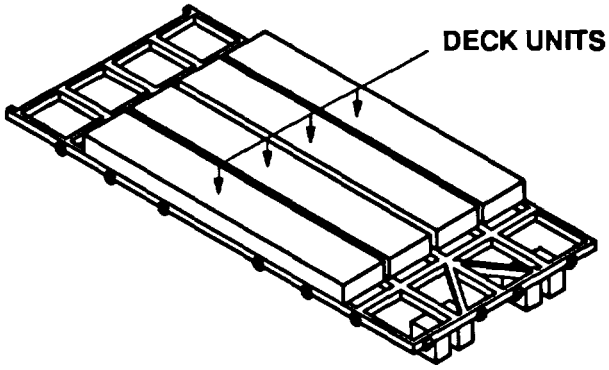
ES 11/12

d. Pallet Load SSE and SSE 6/8

(1) Place four deck units on the pallet as shown.

(a) Outside deck units are placed with edge flush with side of pallet.

(b) Center deck units are spaced approximately 3 in (7.6 cm) apart.



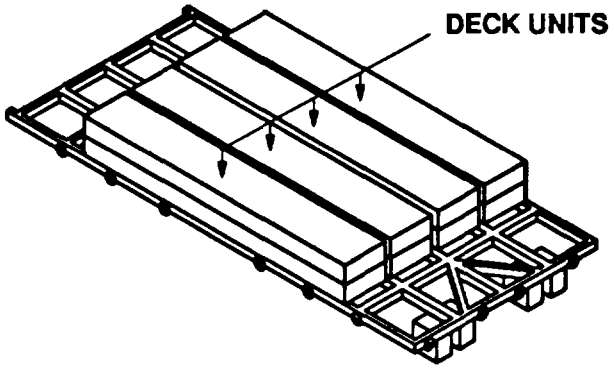
SSE
SSE 6/8

FOR SSE PROCEED TO STEP (2).

FOR SSE 6/8 PROCEED TO STEP (3).

Pallet Load SSE.

(2) Place four deck units on top of the four deck units placed on load in step (1). Ensure that stacking lugs and recesses are used for correct alignment.



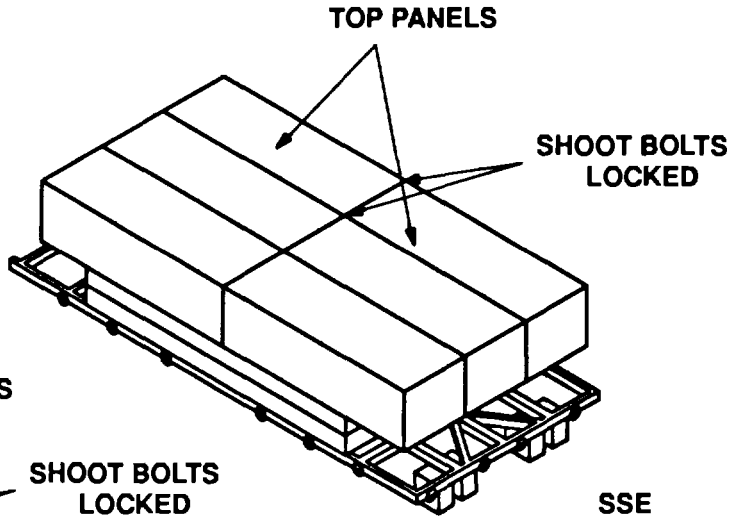
SSE

Pallet Load SSE and SSE 6/8.

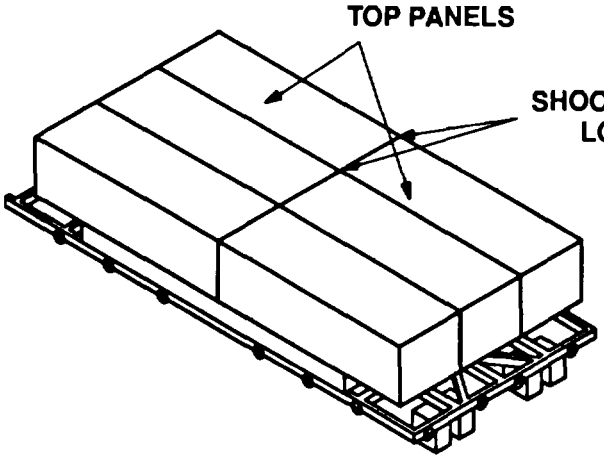
(3) Place six top panels on top of deck units.

(a) Ensure that shoot bolts are put in locked position after panels are butted together.

(b) Center top panels over deck units.

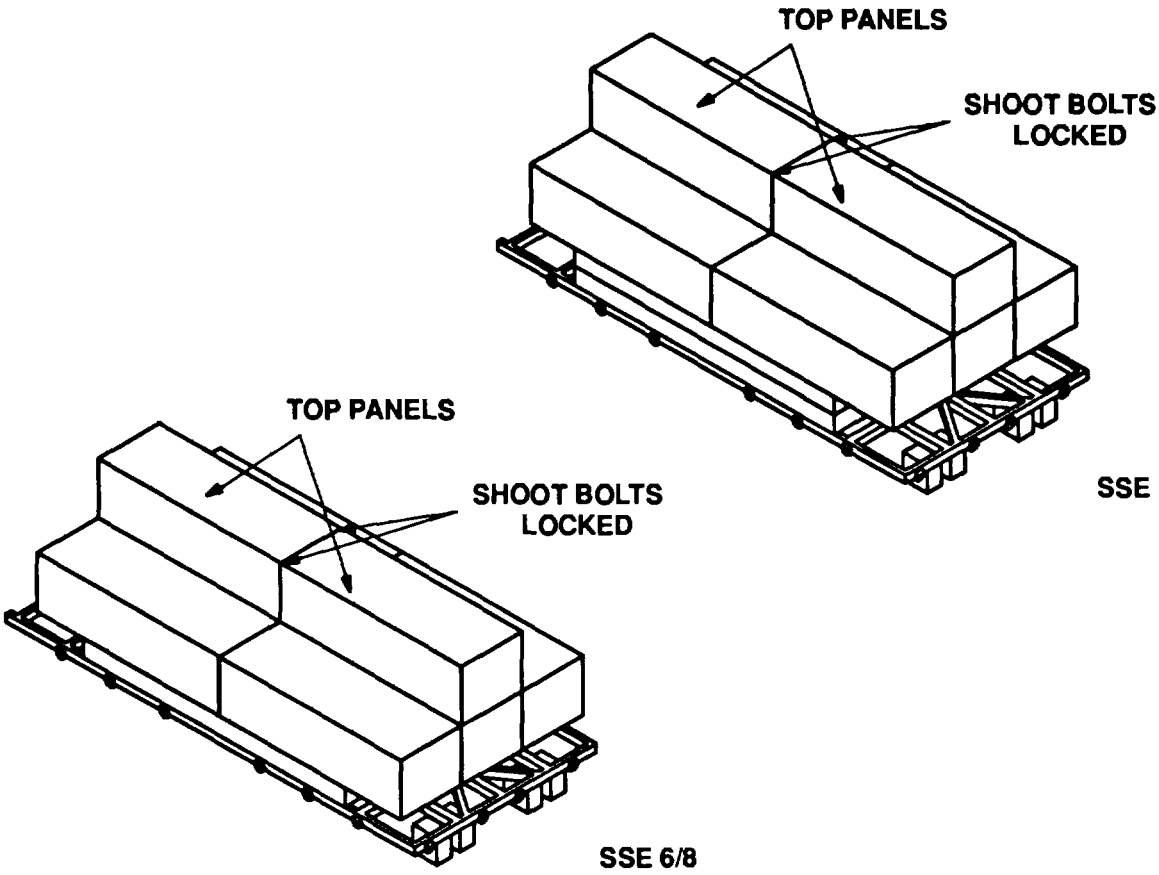


SSE

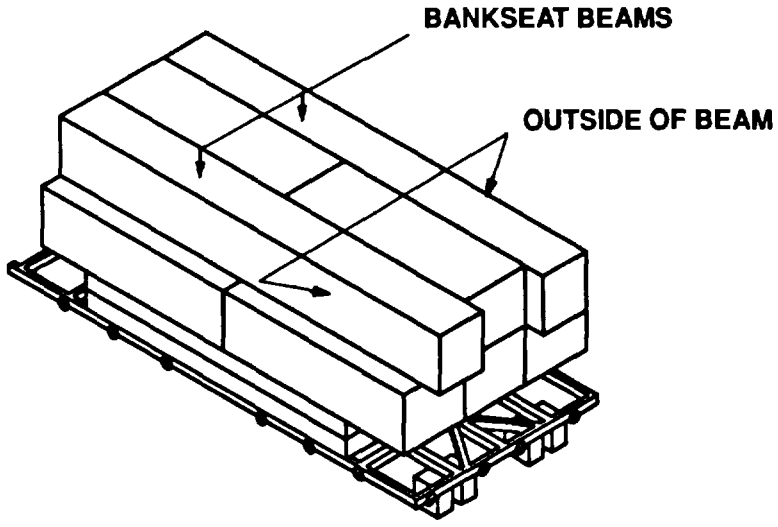


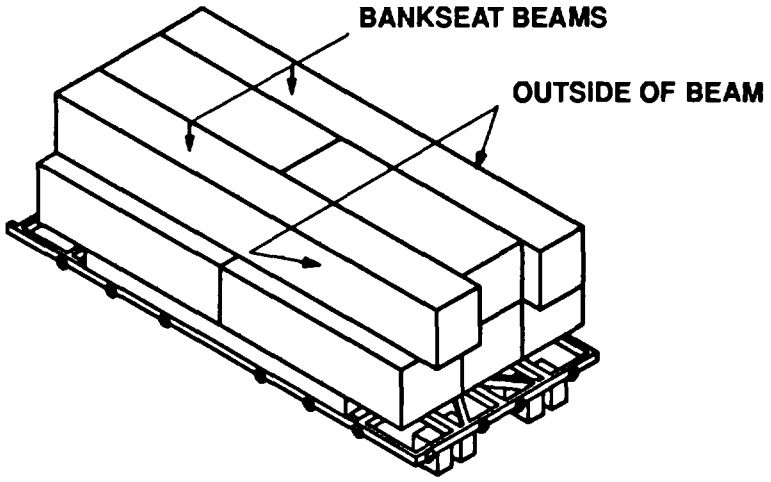
SSE 6/8

(4) Place two top panels on top of center top panels. Ensure shoot bolts are in locked position.



(5) Place one bankseat beam on each side of top panels loaded in step (4). Ensure that the outside of beam faces outside of load.





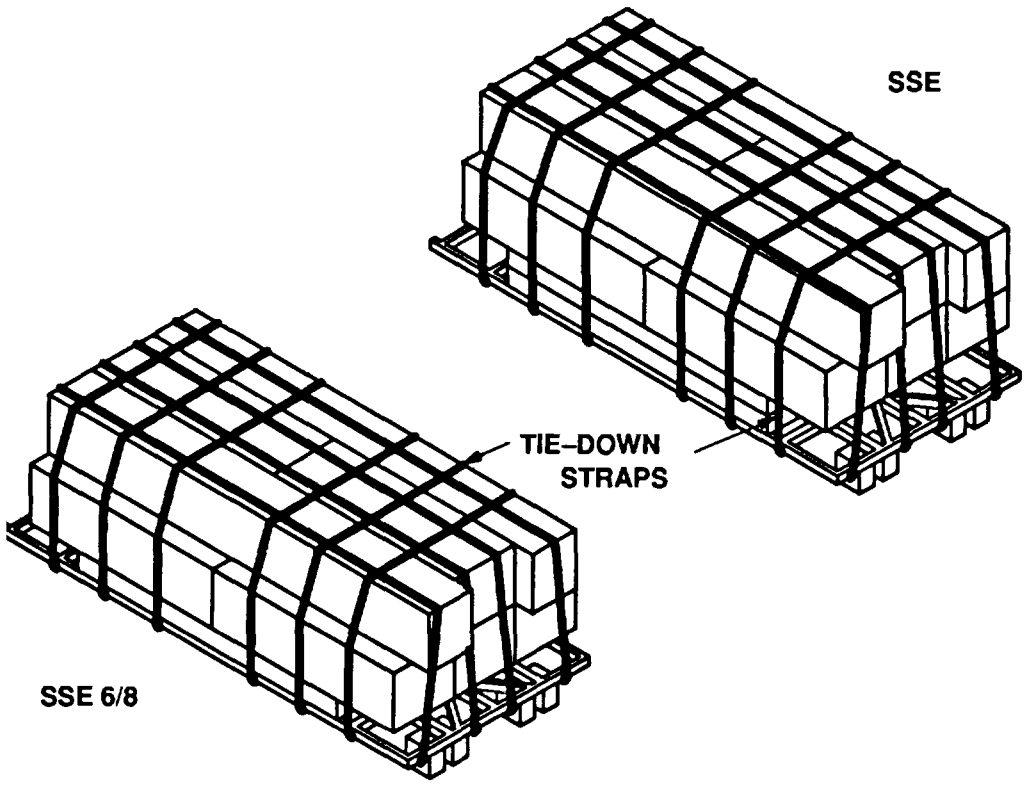
SSE 6/8

(6) Secure load with ten 10,000 lb. cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE
To unload the pallet, carry out the steps In reverse order.

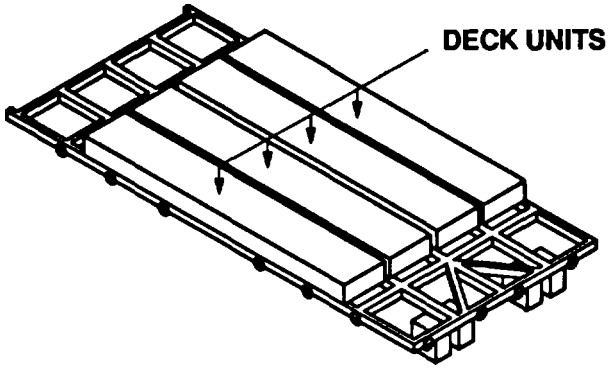


e. Pallet Load SSC 8 thru 12

(1) Place four deck units on the pallet as shown.

(a) Outside deck units are placed with their edge flush with side of pallet.

(b) Center deck units are spaced approximately 3 in (7.6 cm) apart.



SSC 8 thru 12

FOR SSC 8 PROCEED TO STEP (2).

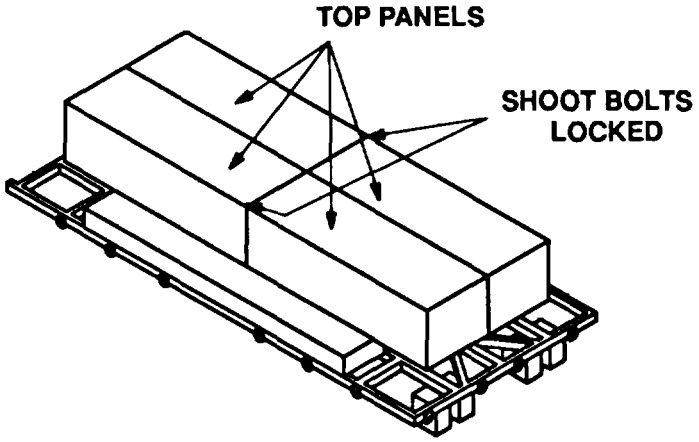
FOR SSC 9 THRU 12 PROCEED TO STEP (3).

Pallet Load SSC 8.

(2) Place four top panels on top of deck units.

(a) Ensure that shoot bolts are put in locked position.

(b) Center top panels over deck units (in both directions).



SSC 8

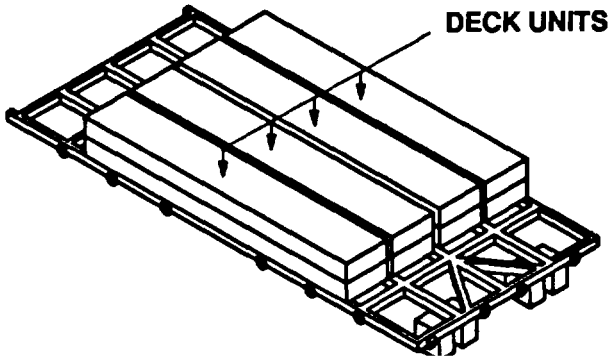
3–79

SSC 8

FOR SSC 8 PROCEED TO STEP (10).

Pallet Load SSC 9 thru 12.

(3) Place four deck units on top of the four deck units loaded in step (1). Ensure that stacking lugs and recesses are used for correct alignment.



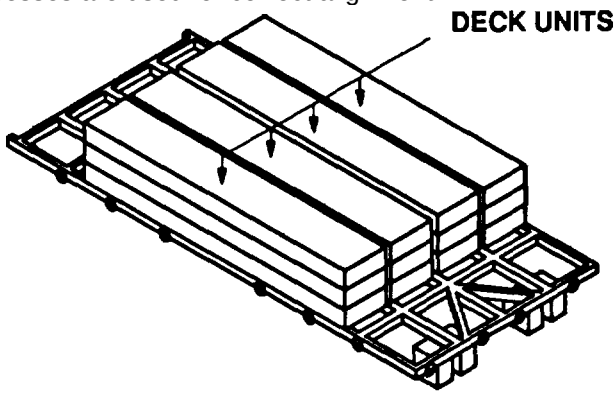
SSC 9 thru 12

FOR SSC 9 THRU 11 PROCEED TO STEP (6)

FOR SSC 12 PROCEED TO STEP (4).

Pallet Load SSC 12.

(4) Place four deck units on top of the four deck units loaded in step (3). Ensure that stacking lugs and recesses are used for correct alignment.



SSC 12

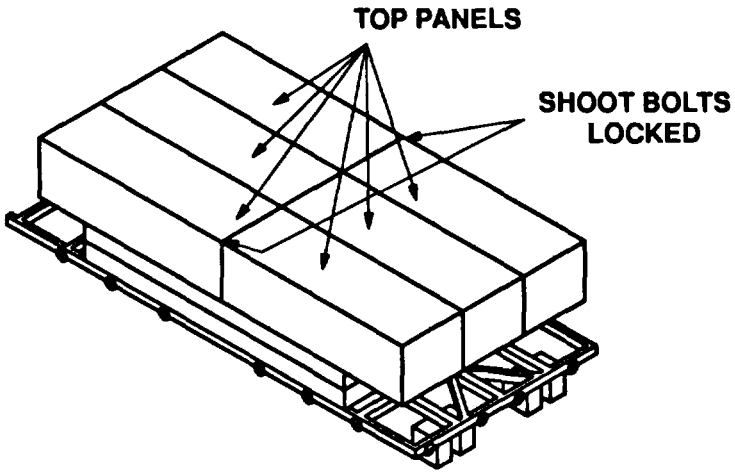
FOR SSC 12 PROCEED TO STEP (8).

Pallet Load SSC 9 thru 11.

(5) Place six top panels on top of deck units.

(a) Ensure that shoot bolts are put in locked position after panels are butted together.

(b) Center top panels over deck units.



SSC 9 thru 11

FOR SSC 10 PROCEED TO STEP (7).

FOR SSC 11 PROCEED TO STEP (10).

Pallet Load SSC 9.

(6) Place four top panels on top of top panels loaded in step (5).

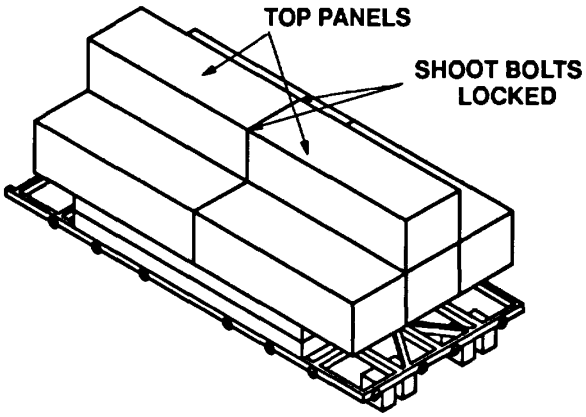
(a) Ensure that shoot bolts are put in locked position.

(b) Center the four top panels over the six top panels (in both directions).

FOR SSC 9 PROCEED TO STEP (10).

Pallet Load SSC 10

(7) Place two top panels on top of the center top panels. Ensure shoot bolts are in locked position.

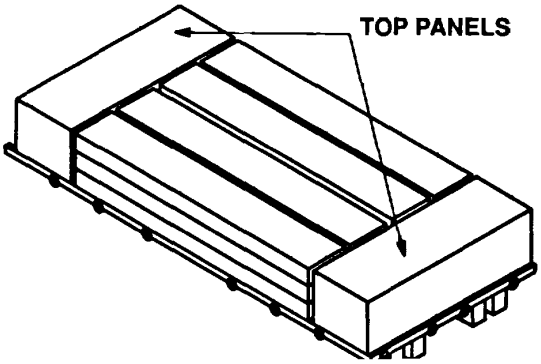


SSC 10

FOR SCC 10 PROCEED TO STEP (10)

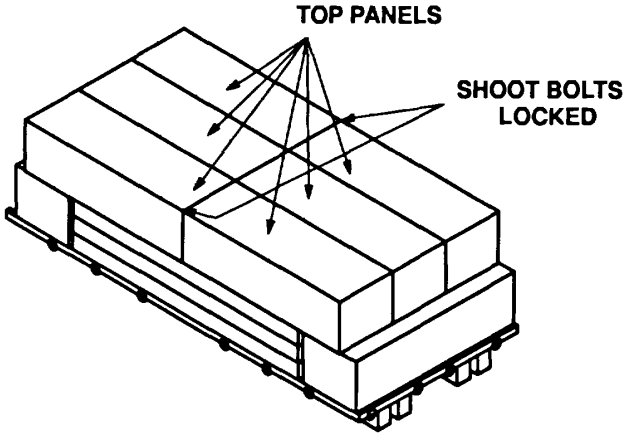
Pallet Load SSC 12

(8) Place two top panels across front and rear of pallet as shown.



SSC 12

(9) Place six top panels on deck units and top panels. Ensure that shoot bolts are placed in locked position.



SSC 12

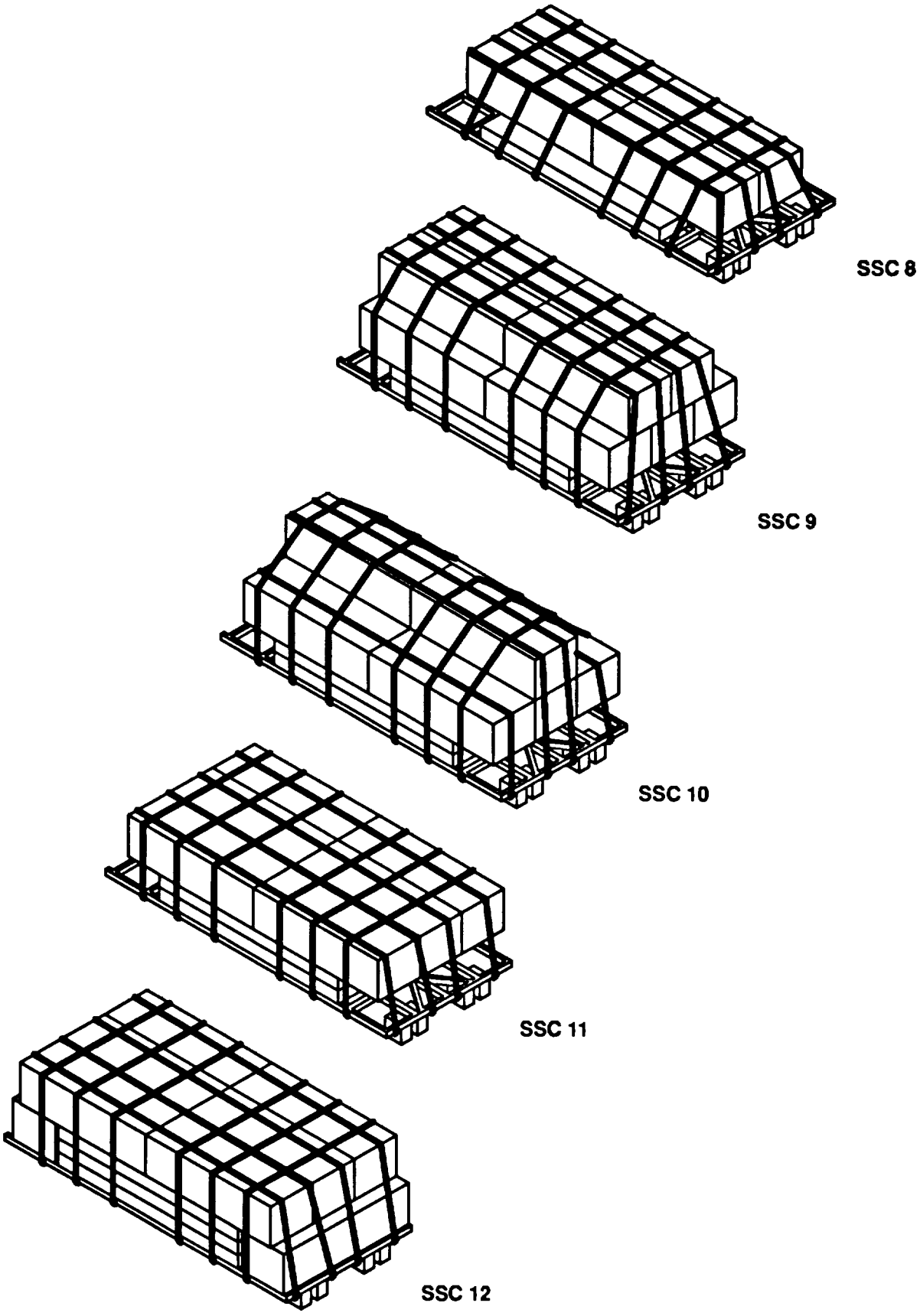
Pallet Load SSC 8 thru 12.

(10) Secure load with ten 10,000 lb. cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION

Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

NOTE
To unload the pallet, carry out the steps In reverse order.


SSC 8
SSC 9
SSC 10
SSC 11
SSC 12

3-20 PALLETIZATION - DOUBLE STORY

Double story pallet loads are basic variations of the following four different types.

ED - (Erection Double). ED pallets contain the erection and launch components.

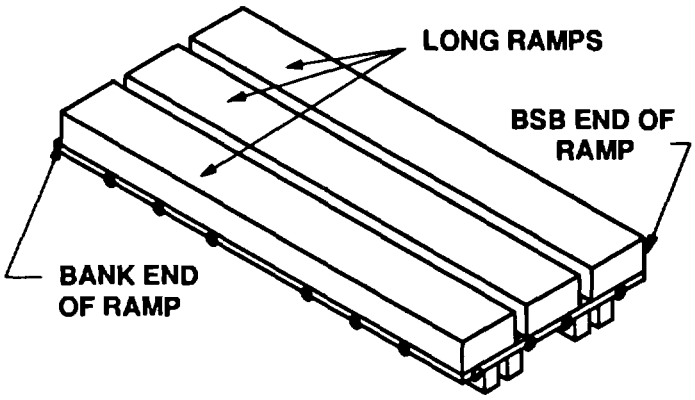
LR/D - (Long Ramp Deck). LR/D pallets contain long ramp and deck units.

EOB - (End of Bridge). EOB pallets contain all the components needed to construct the end of the bridge, one variation shown (EOB1) contains two long ramps.

DSC - (Double Story Center). DSC pallets contain complete bays of double story bridge. For example, a DSC 2 pallet contains two complete bays of bridge on it.

a. Pallet Load LR/D

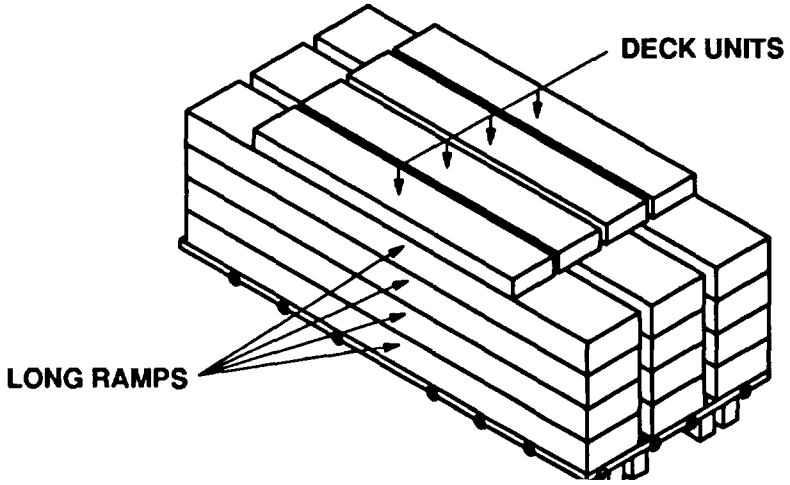
(1) Place three long ramps on pallet.



LR/D

(2) Stack three long ramps on top of each of the ramps placed on pallet in step (1). Ensure that ramps are stacked as neatly as possible using stacking lugs and recesses for correct alignment.

(3) Place four deck units on top of ramp sections.



LR/D

(4) Secure load with ten 10,000 lb. cargo tie-down straps (four lengthwise straps and six crosswise straps).

(a) Place lengthwise straps across the pallet load.

(b) The strap's ratchet assembly is placed to the rear of the pallet.

(c) Hook straps to shackles.

(d) Tighten straps.

(e) Place crosswise straps across pallet load.

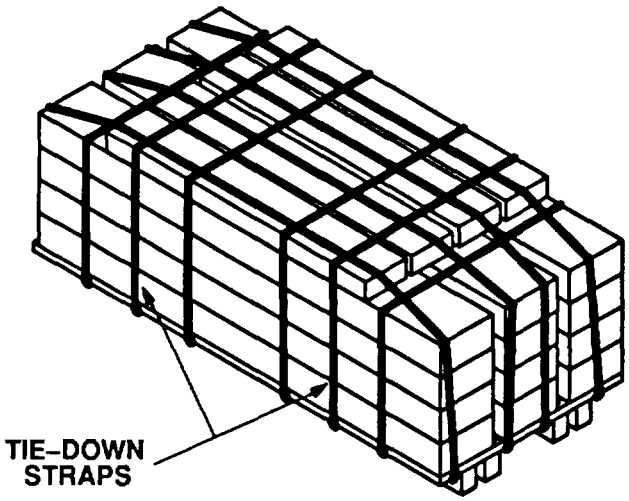
(f) The strap's ratchet assembly is placed on right side of pallet.

(g) Hook straps to shackles.

(h) Tighten straps.

(i) Tie the rubber bumper across the pallet load near the rear of the load.

NOTE
To unload the pallet, carry out the preceding steps In reverse order.



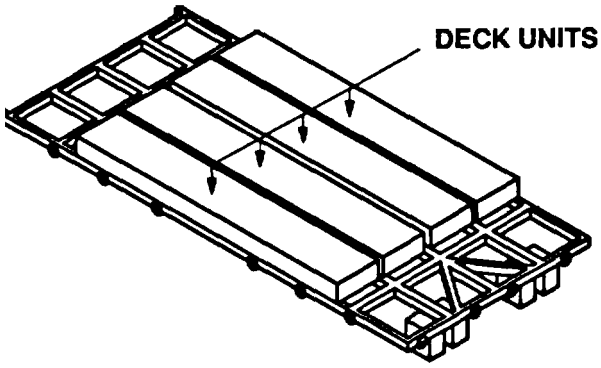
LR/D

b. Pallet Loads DSC, EOB1 and EOB2

(1) Place four deck units on pallet as shown.

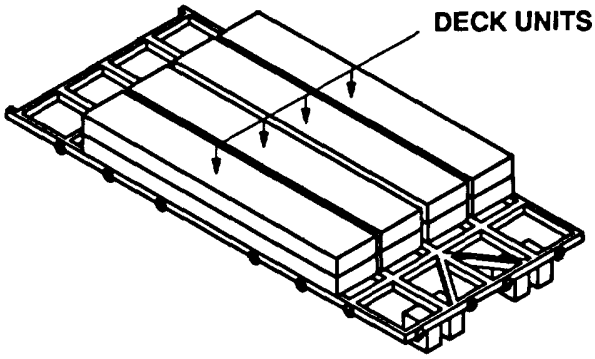
(a) Outside deck units are placed with edge flush with side of pallet.

(b) Center deck units are spaced approximately 3 in (7.6 cm) apart.



DSC
EOB 1
EOB 2

(2) Place four deck units on top of the four deck units loaded in step (1). Ensure that stacking lugs and recesses are used for correct alignment.

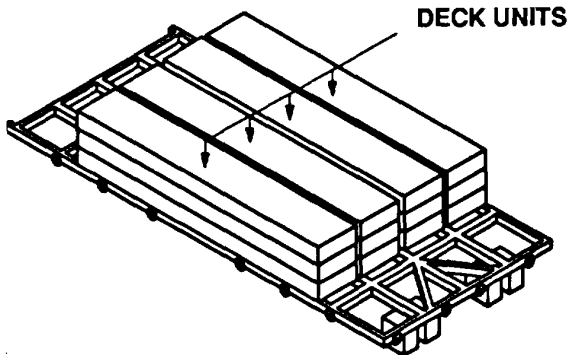


DSC
EOB 1
EOB 2

FOR EOB1 and EOB2 PROCEED TO STEP (12).

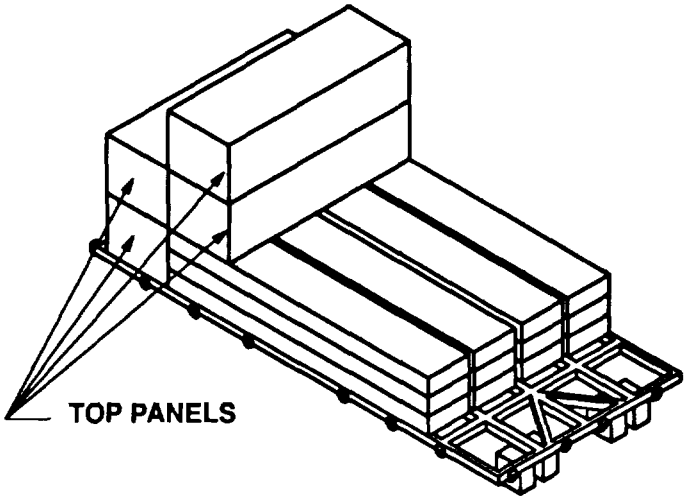
Pallet Load DSC.

(3) Place four deck units on top of the four deck units loaded in step (2). Ensure that stacking lugs and recesses are used for correct alignment.



DSC

(4) Place four top panels across the front of pallet and on top of deck units.

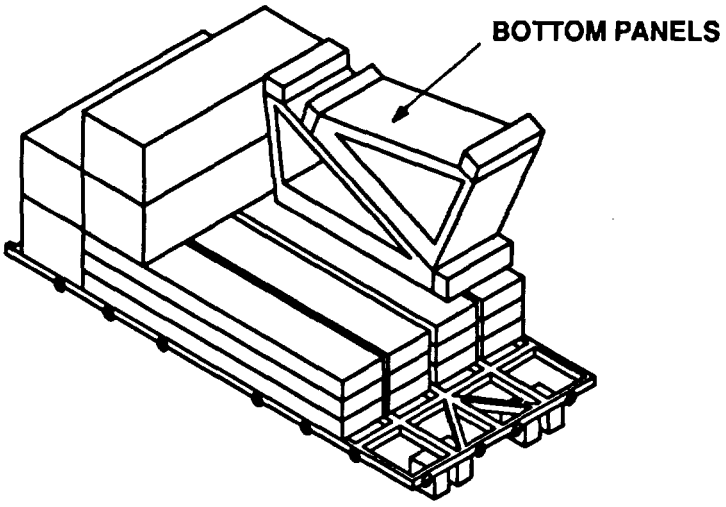


DSC

(5) Stack one bottom panel on top of another bottom panel and position panels on deck units as shown.

(a) Ensure that shoot bolts of bottom panels are in closed position.

(b) Ensure that upper bottom panel rests in the stacking lugs of lower bottom panel.

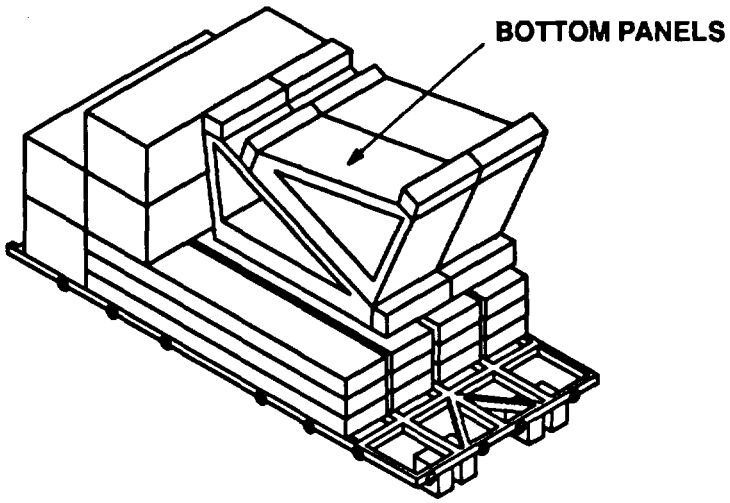


DSC

(6) Stack one bottom panel on top of another bottom panel and position panels on deck units as shown.

(a) Ensure that shoot bolts of bottom panels are in closed position.

(b) Ensure that upper bottom panel rests in the stacking lugs of lower bottom panel.

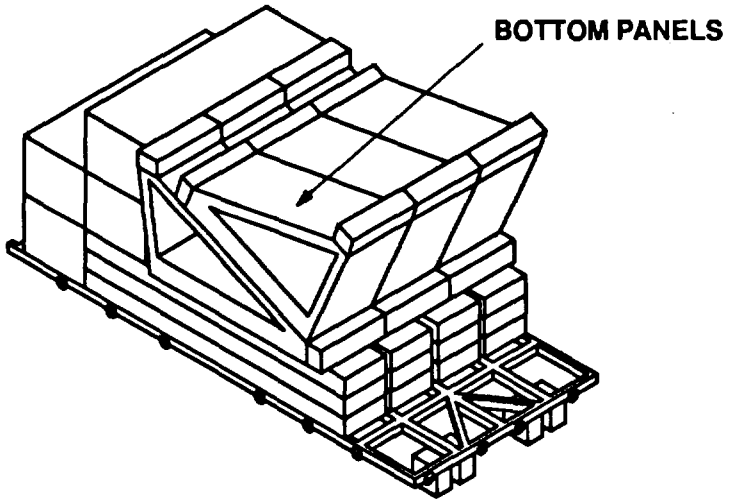


DSC

(7) Stack one bottom panel on top of another bottom panel and position panels on deck units as shown.

(a) Ensure that shoot bolts of bottom panels are in closed position.

(b) Ensure that upper bottom panel rests in the stacking lugs of lower bottom panel.



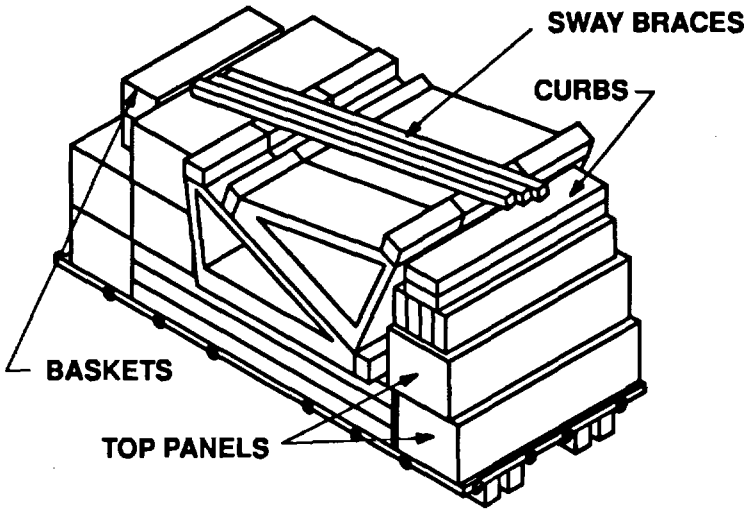
DSC

(8) Stack two top panels across rear of pallet.

(9) Stack six curbs on top of top panels.

(10) Place three sway braces on top of center stack of bottom panels.

(11) Stack two baskets on top of front set of top panels.



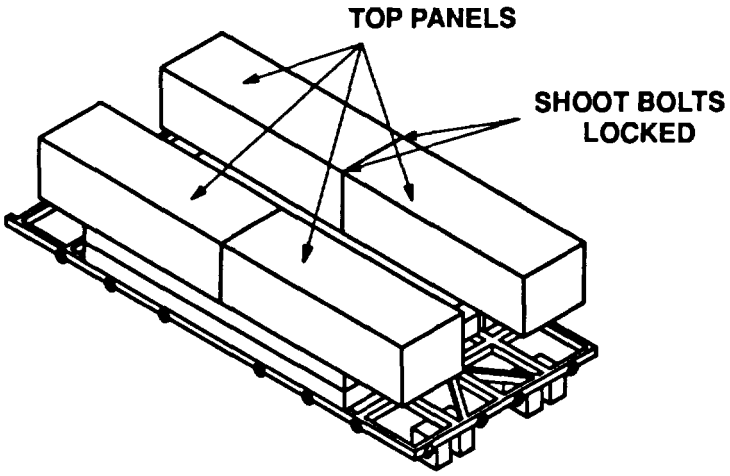
DSC

Pallet Loads EOB1 and EOB2.

(12) Place four top panels on top of deck units.

(a) Ensure that shoot bolts are put in locked position after panels are butted together.

(b) Center top panels are over deck units.

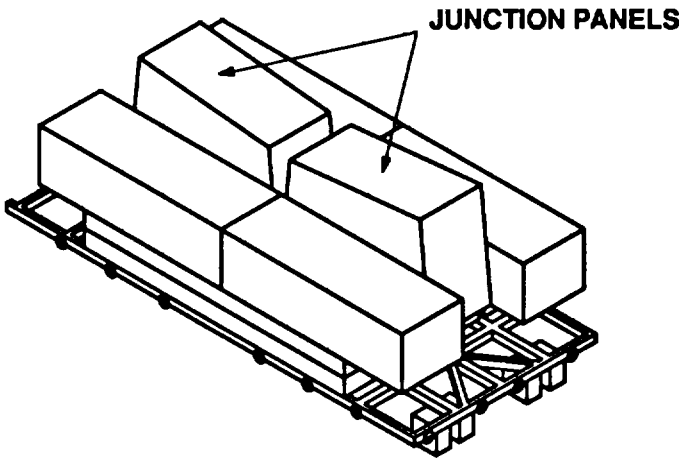


EOB 1
EOB 2

(13) Place two junction panels on deck units between the top panels. Use timber packing (3 in x 8 in x 36 in) between junction panels and deck units. Position the packing so that there is clearance between the junction panel dowels and the deck units.

(a) The long side of junction panels face down on the deck units.

(b) The bottom of the junction panels face each other.

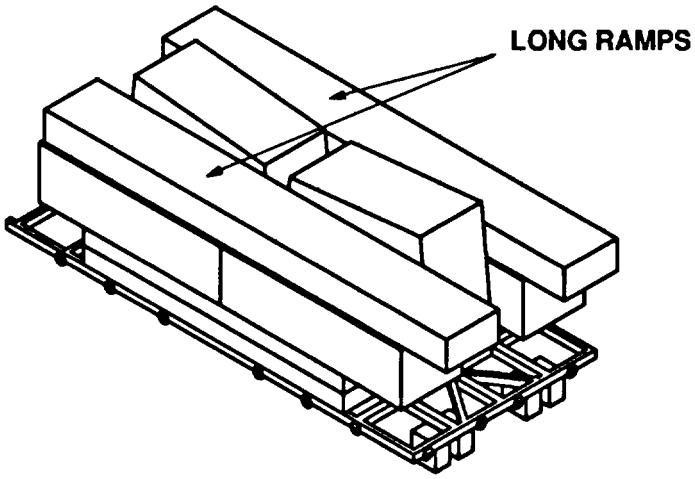


EOB 1
EOB 2

FOR EOB2 PROCEED TO STEP (15).

Pallet Load EOB1.

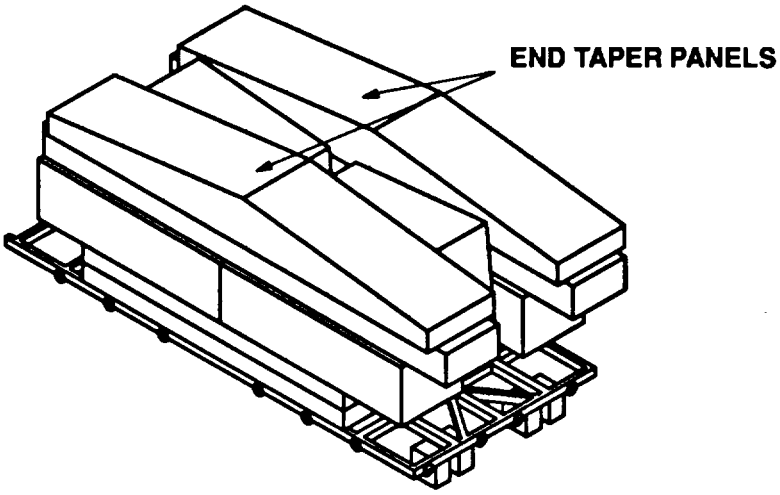
(14) Place two long ramps on top of top panels.



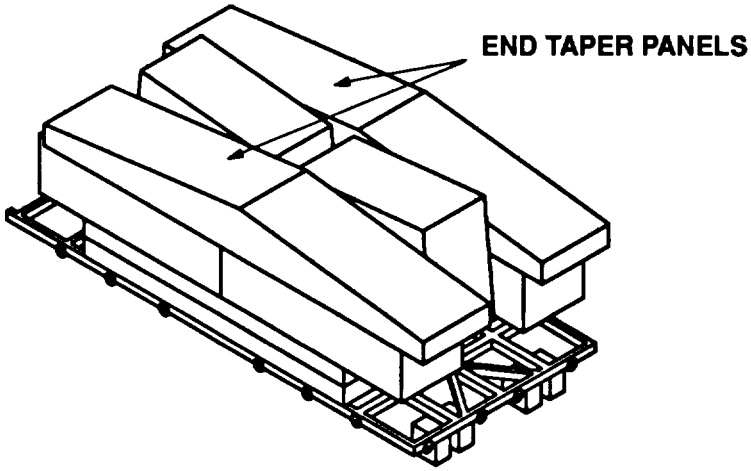
EOB 1

Pallet Loads EOB1 and EOB2.

(15) Place two end taper panels on top of long ramps.

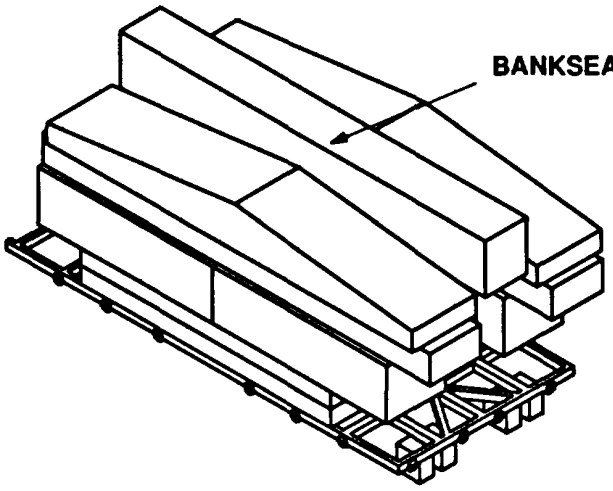


EOB 1

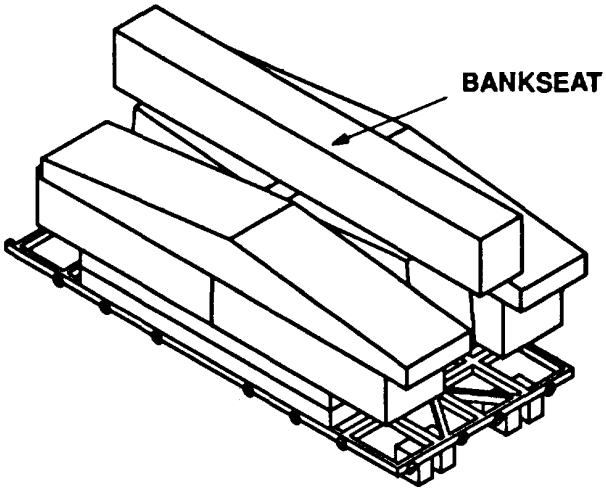


EOB 2

(16) Place one bankseat beam on top of junction panel. Ensure that inside of beam faces down. Use timber packing (3 in x 8 in x 36 in) between the bankseat beam and the junction panels. Position the packing so that there is clearance between the junction panel dowels and the bankseat beam.

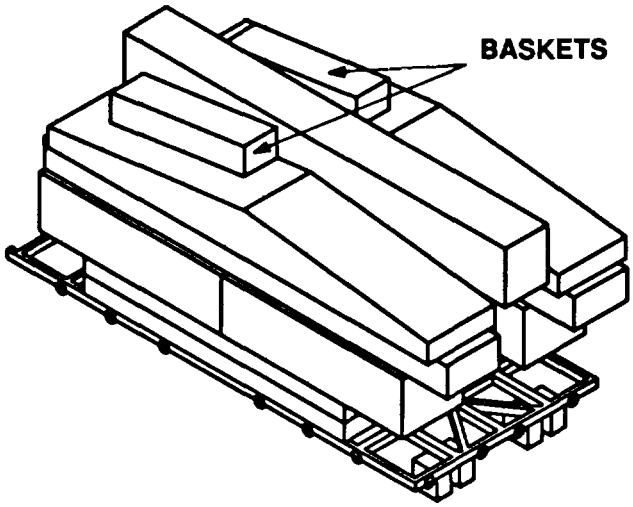


EOB 1

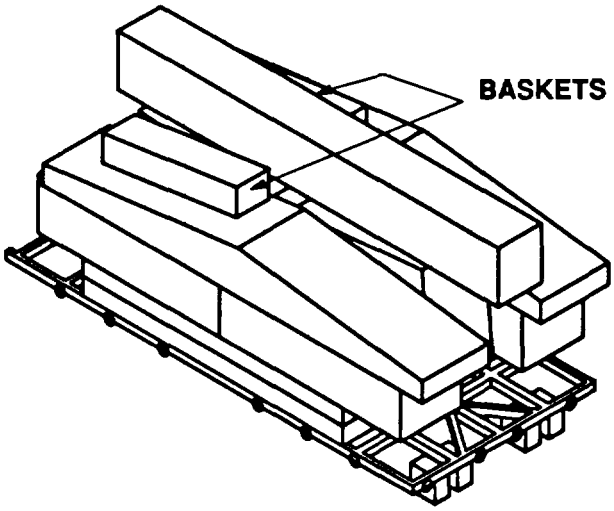


EOB 2

(17) Place two baskets on top of end taper panels near front of pallet load.



EOB 1



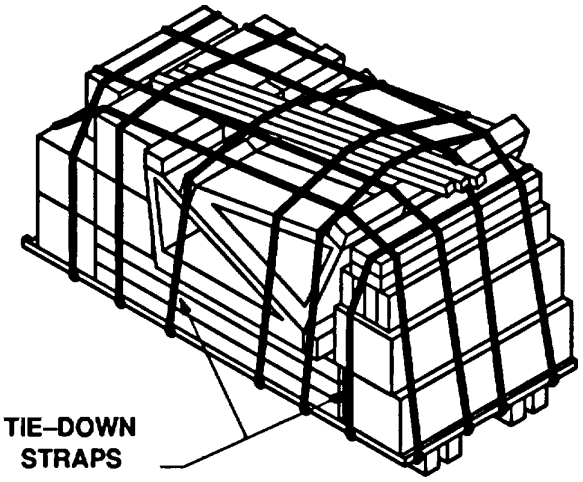
EOB 2

Pallet Loads DSC, EOB1 and EOB2.

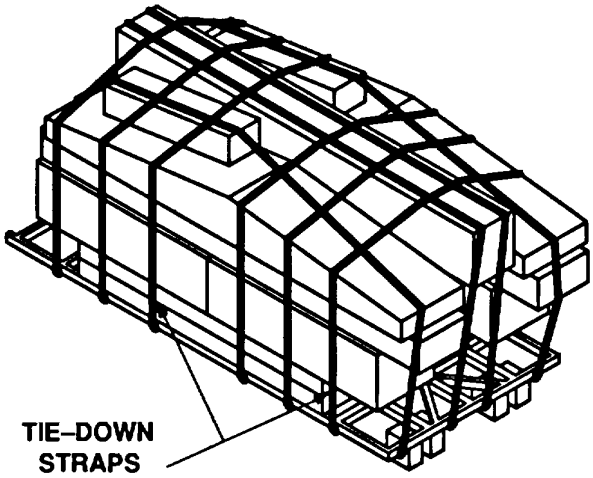
(18) Secure load with ten 10,000 lb cargo tie-down straps (four lengthwise straps and six crosswise straps), as described in step a. (4).

CAUTION
Unbolt shootbolts before off-loading top panels or damage to top panels will occur.

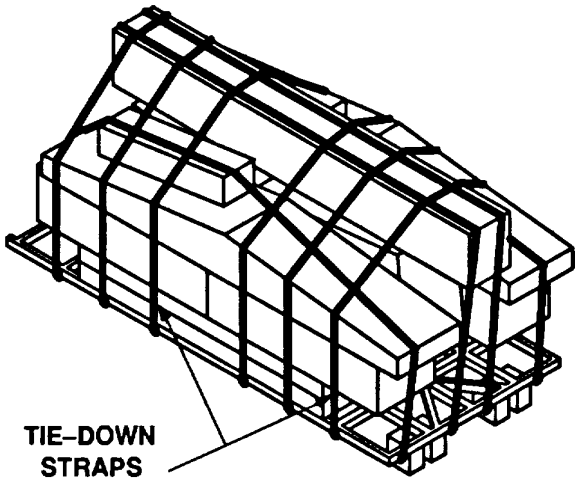
NOTE
To unload the pallet, carry out the steps In reverse order.



DSC



EOB 1



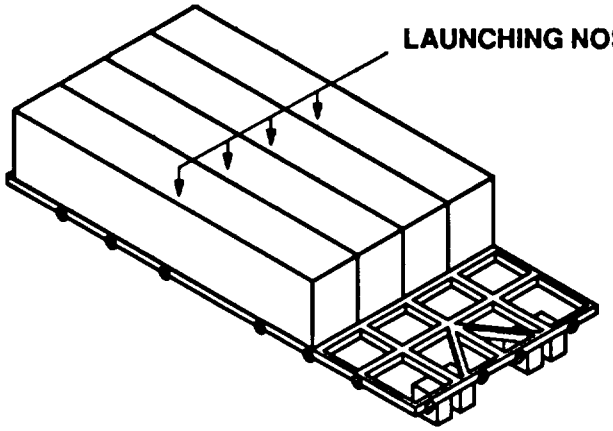
EOB 2

c. Pallet Load ED

(1) Place four launching nose heavy sections on pallet as shown.

(a) Front end of nose sections are flush with front edge of pallet.

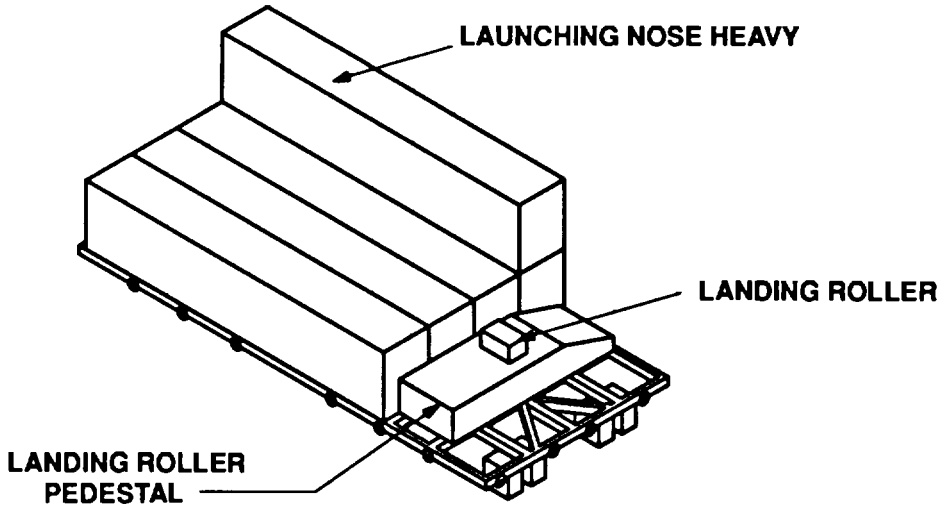
(b) Sides of outer nose sections are flush with sides of pallet.



ED

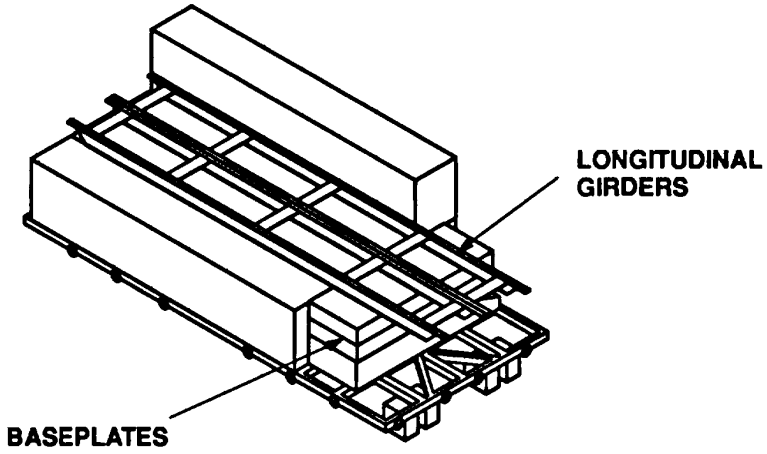
(2) Place one launching nose heavy section on top of nose section on right side of pallet.

(3) Place one landing roller pedestal on rear of pallet and against rear of nose sections. Place landing roller upside down in landing roller pedestal.



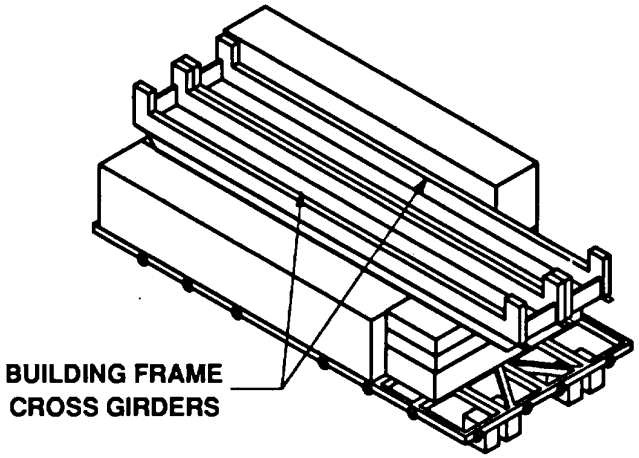
ED

(4) Place two baseplates on top of landing roller pedestal, then place two longitudinal girders on top of the two center nose sections and baseplates. Ensure that the ends of the longitudinal girders are flush with the front of the nose sections.



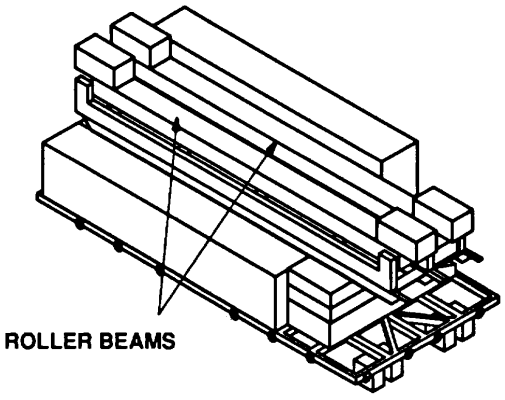
ED

(5) Place two building frame cross girders on top of the two longitudinal girders. Ensure that front of cross girders are flush with front of nose sections.



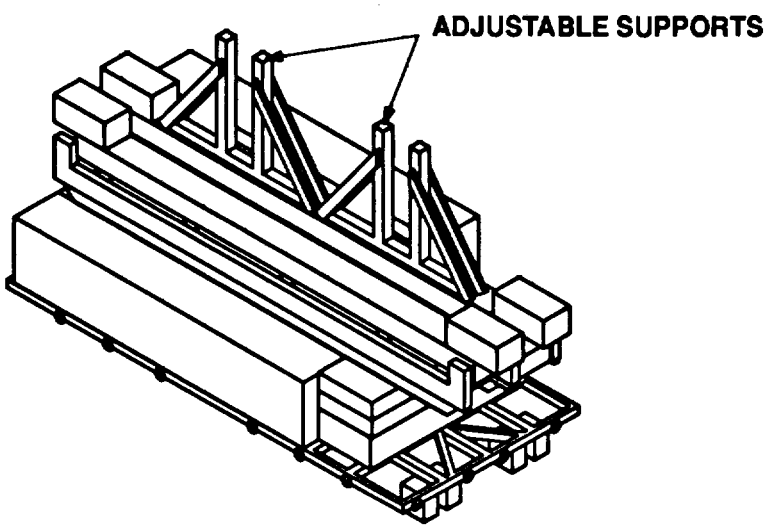
ED

(6) Place two roller beams into cross girders. Front end of roller beams will extend slightly forward of the ends of the cross girders.



ED

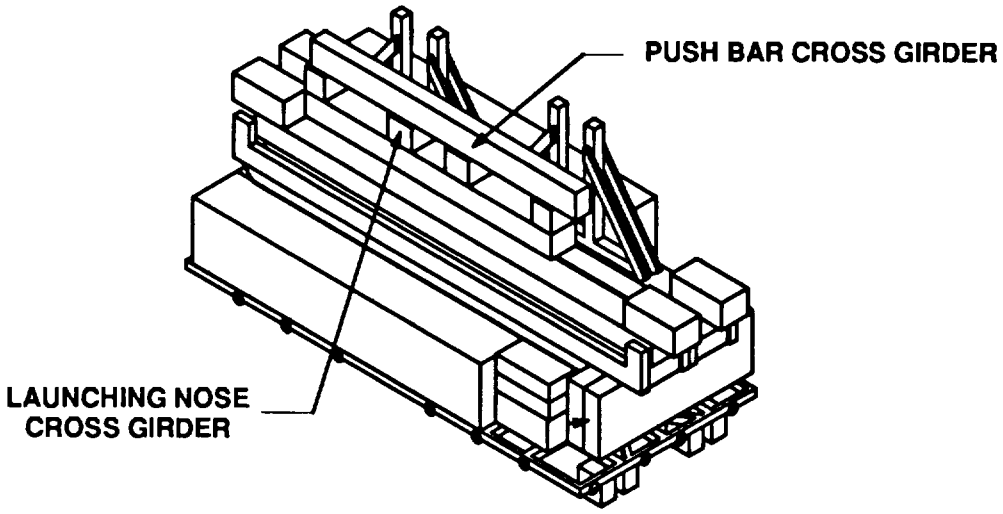
(7) Place two adjustable supports on top of roller beam. These supports will rest against the heavy nose section on right side of load.



ED

(8) Place one launching nose cross girder next to adjustable supports.

(9) Place one push bar cross girder on top of launching nose cross girder.

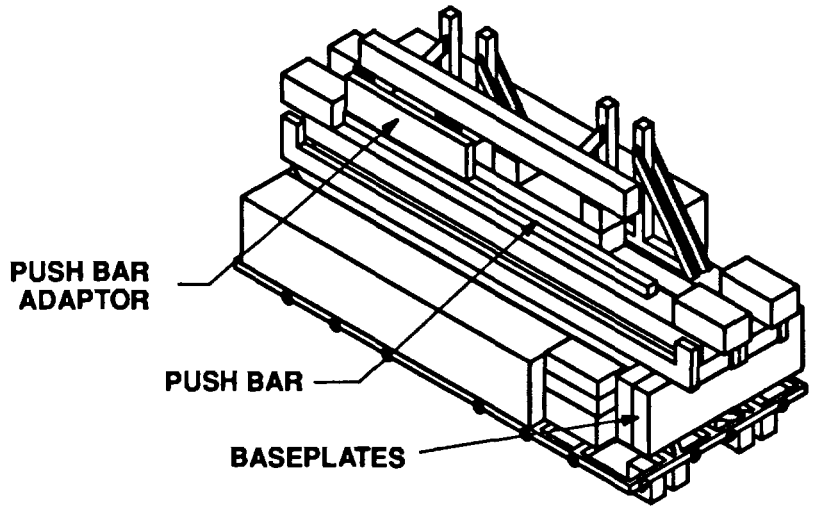


ED

(10) Place one push bar next to launching nose cross girder.

(11) Place one push bar adapter on top of push bar.

(12) Place two baseplates across rear of pallet. Tops of baseplates must face each other.

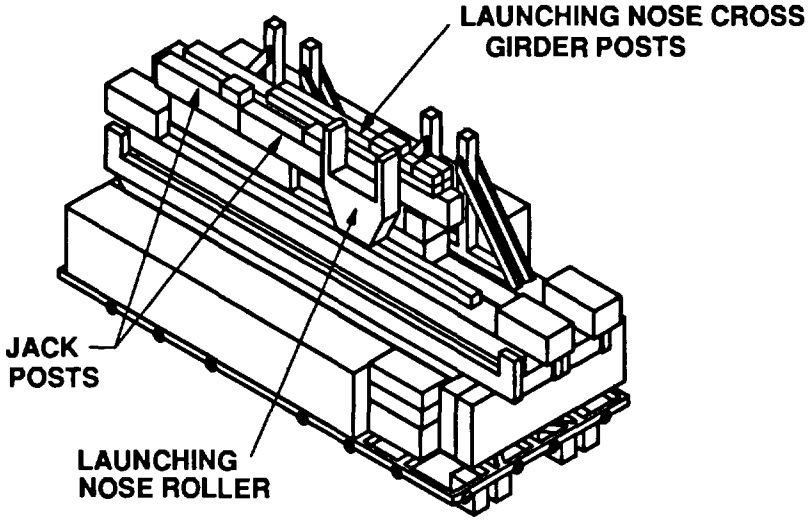


ED

(13) Place two launching nose cross girder posts on top of push bar cross girder.

(14) Place two jack posts on top of push bar adapter.

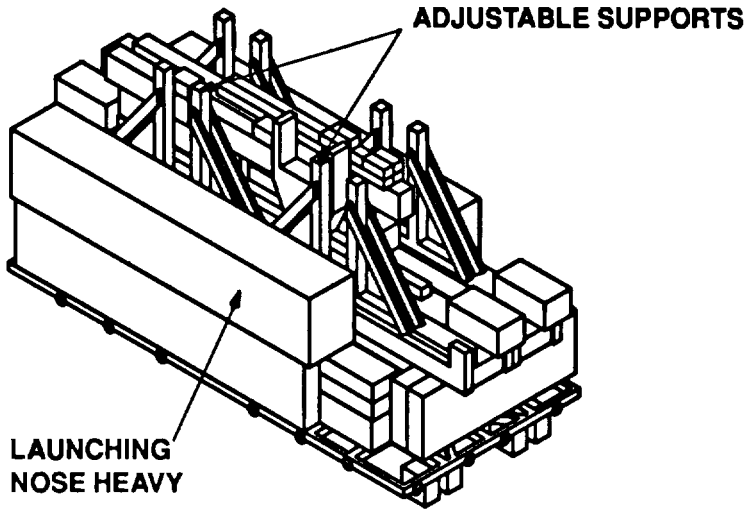
(15) Place one launching nose roller on top of push bar. Nose roller is placed in vertical position.



ED

(16) Place one launching nose heavy on top of nose section on left side of pallet.

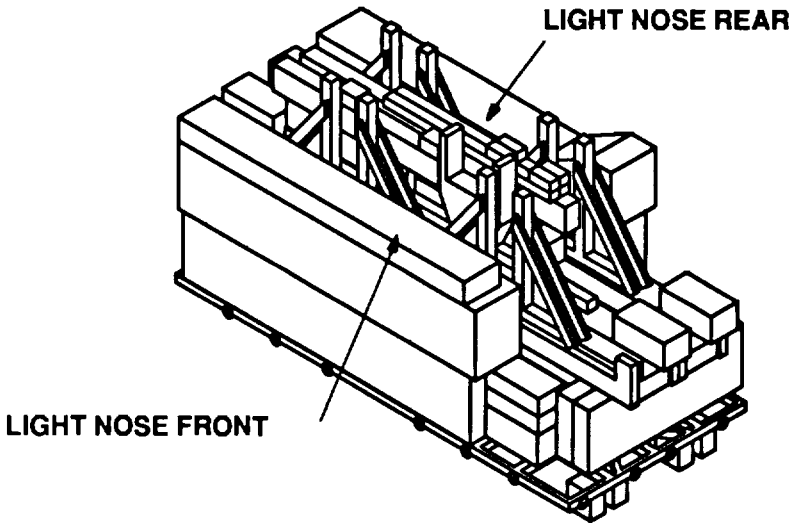
(17) Place two adjustable supports on top of roller beam next to nose section.



ED

(18) Place one light nose front section on top of heavy nose section on left side of load.

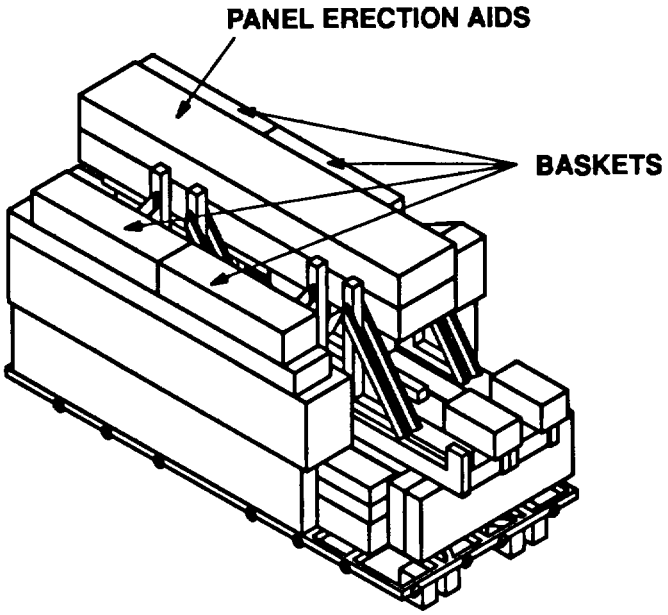
(19) Place one light nose rear section on top of heavy nose section on right side of load.



ED

(20) Place two panel erection aids on top of small parts between adjustable supports.

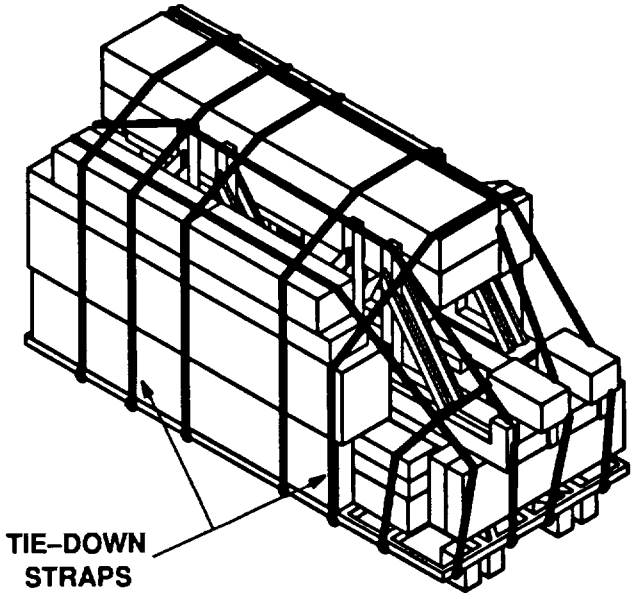
(21) Place four baskets on top of light nose sections.



ED

(22) Secure load with ten 10,000 lb cargo tie-own straps, (four lengthwise straps and six crosswise straps), as described in step a. (4).

NOTE
To unload the pallet, carry out the steps In reverse order.

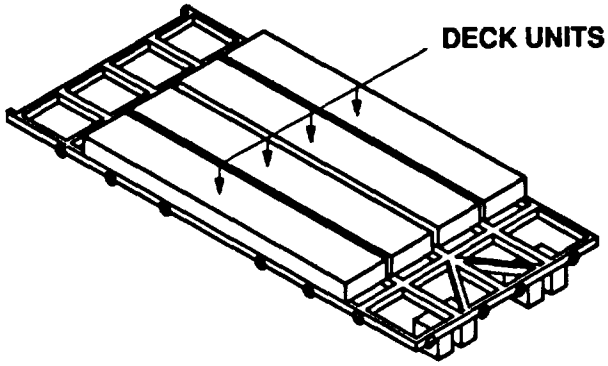


d. Pallet Loads DSC1 and DSC2.

(1) Place four deck units on pallet as shown.

(a) Outside deck units are placed with edge flush with side of pallet.

(b) Center deck units are spaced approximately 3 in (7.6 cm) apart.

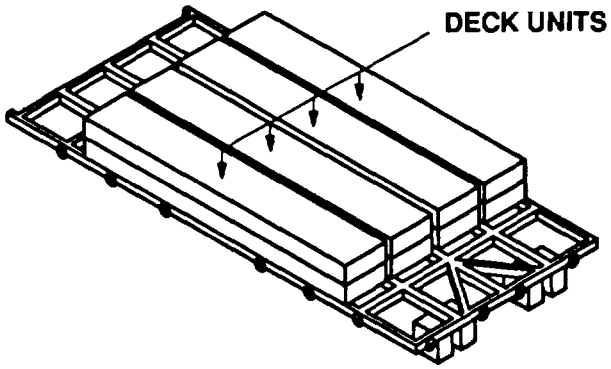


DSC 1
DSC 2

FOR DSC 1 PROCEED TO STEP (3).

Pallet Loads DSC2.

(2) Place four deck units on top of the four deck units loaded in step (1). Ensure that stacking lugs and recesses are used for correct alignment.

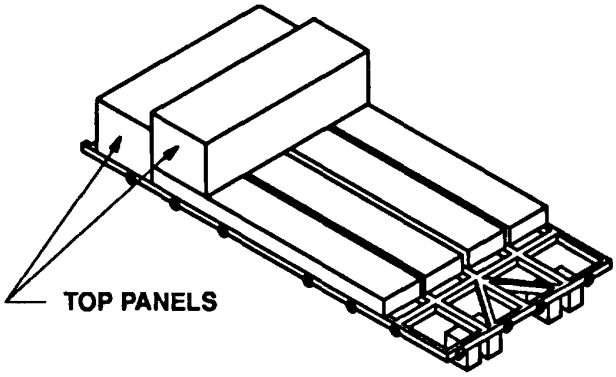


DSC 2

FOR DSC 2 PROCEED TO STEP (4).

Pallet Loads DSC1.

(3) Place two top panels across front of pallet and on top of deck units.

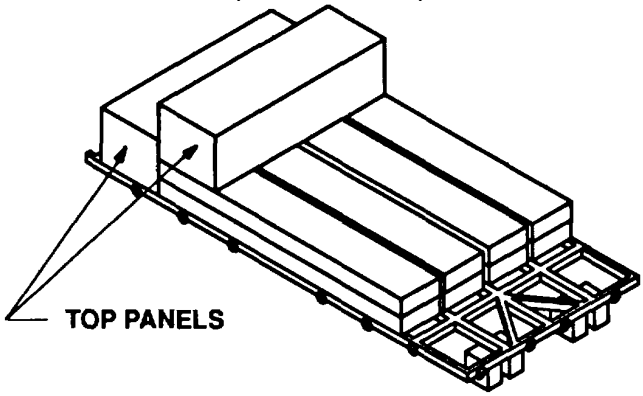


DSC 1

FOR DSC1, PROCEED TO STEP (5).

Pallet Load DSC2.

(4) Place two top panels across front of pallet and on top of deck units.

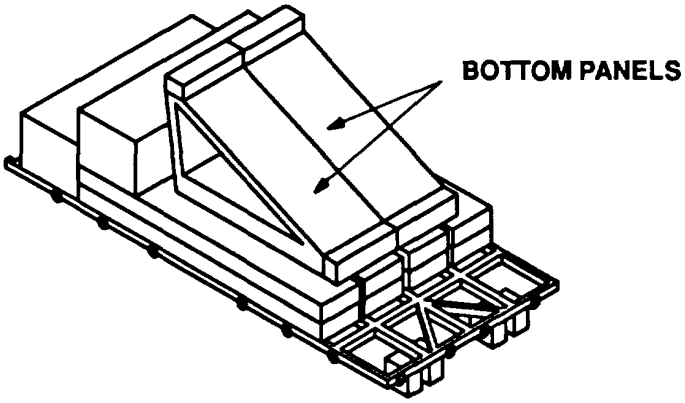


DSC 2

FOR DSC2, PROCEED TO STEP (6).

Pallet Load DSC1.

(5) Place two bottom panels on top of deck units. Ensure that shoot bolts of bottom panels are in closed postion.

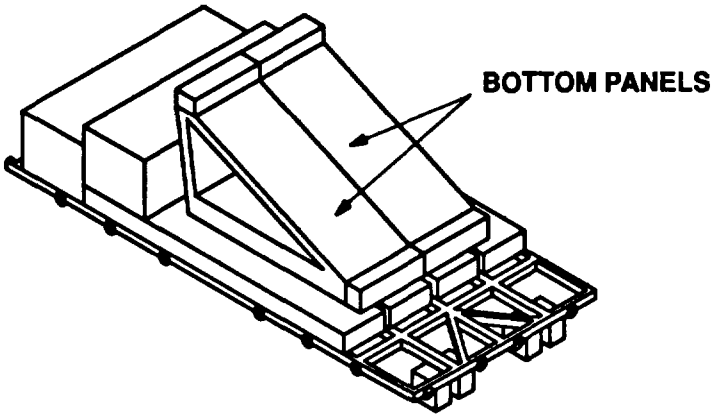


DSC 1

FOR DSC1, PROCEED TO STEP (7).

Pallet Loads DSC2.

(6) Place two bottom panels on top of deck units. Ensure that shoot bolts of bottom panels are in closed position.

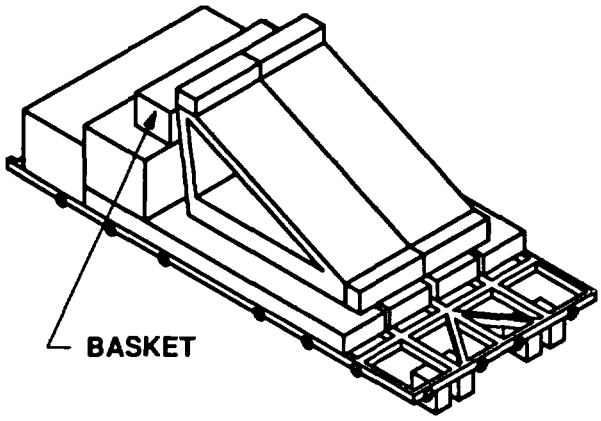


DSC 2

FOR DSC2, PROCEED TO STEP (8).

Pallet Load DSC1.

(7) Place one basket on top of top panel in front of bottom panels.

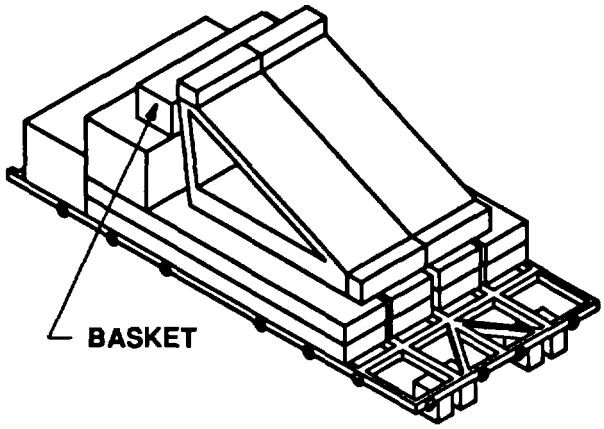


DSC 1

FOR DSC1, PROCEED TO STEP (9).

Pallet Load DSC2.

(8) Place one basket on top of top panel in front of bottom panels.

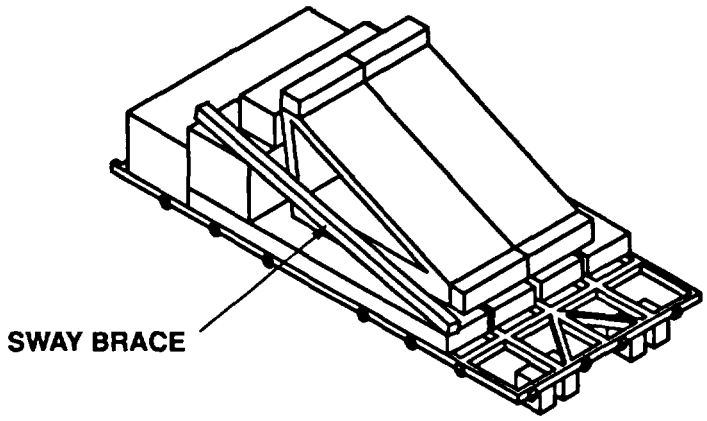


DSC 2

FOR DSC2, PROCEED TO STEP (10).

Pallet Load DSC1.

(9) Place one sway brace along side of bottom panel.



DSC 1

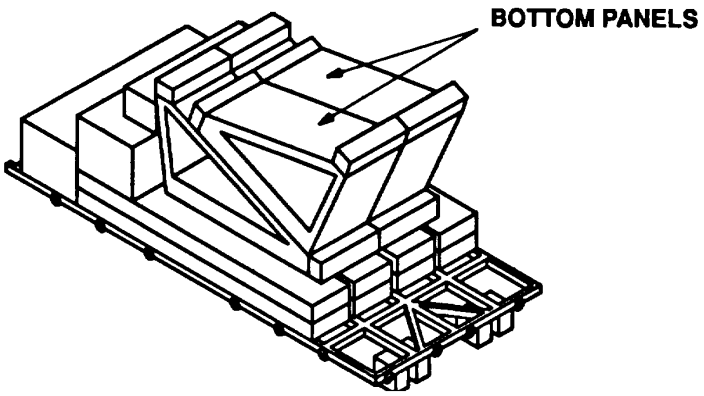
FOR DSC1, PROCEED TO STEP (13).

Pallet Load DSC2.

(10) Stack two bottom panels on top of panels put on in step (6).

(a) Ensure that shoot bolts of bottom panels are in closed position.

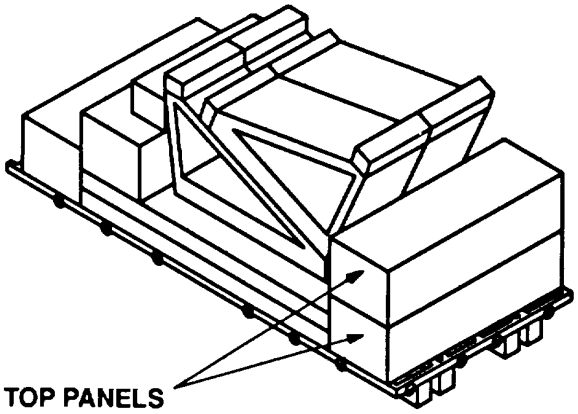
(b) Ensure that upper bottom panel rests in the stacking lugs of lower bottom panel.



DSC 2

Pallet Load DSC2.

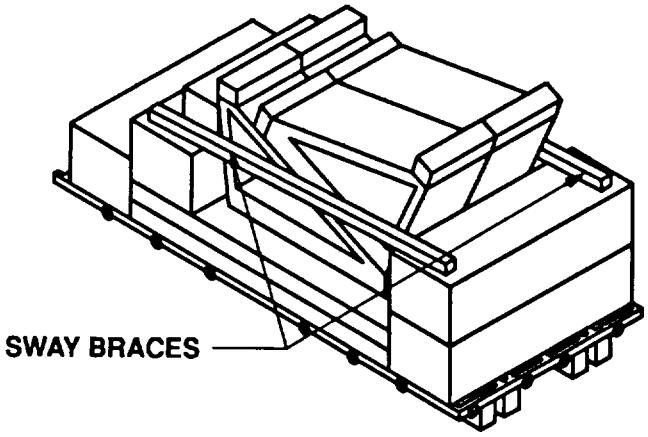
(11) Stack two top panels across rear of pallet.



DSC 2

Pallet Load DSC2.

(12) Place two sway braces on top of top panels and against bottom panels.

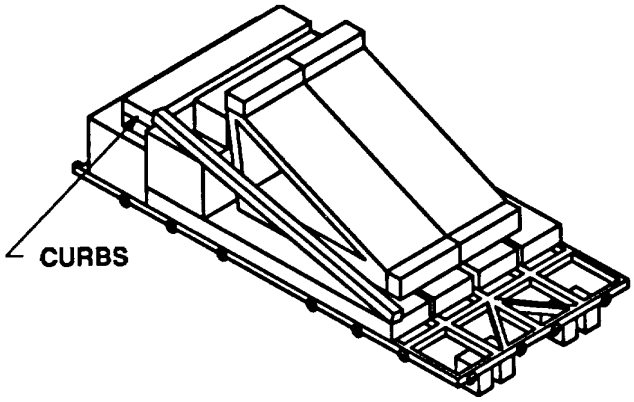


DSC 2

FOR DSC2, PROCEED TO STEP (14).

Pallet Load DSC1.

(13) Stack two curbs on top of top panel on front of pallet.

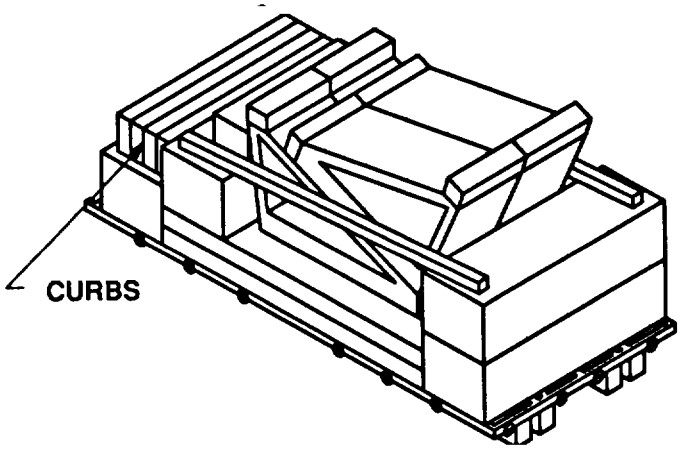


DSC 1

FOR DSC1, PROCEED TO STEP(16).

Pallet Load DSC2.

(14) Stack four curbs on top of top panels on front of pallet.



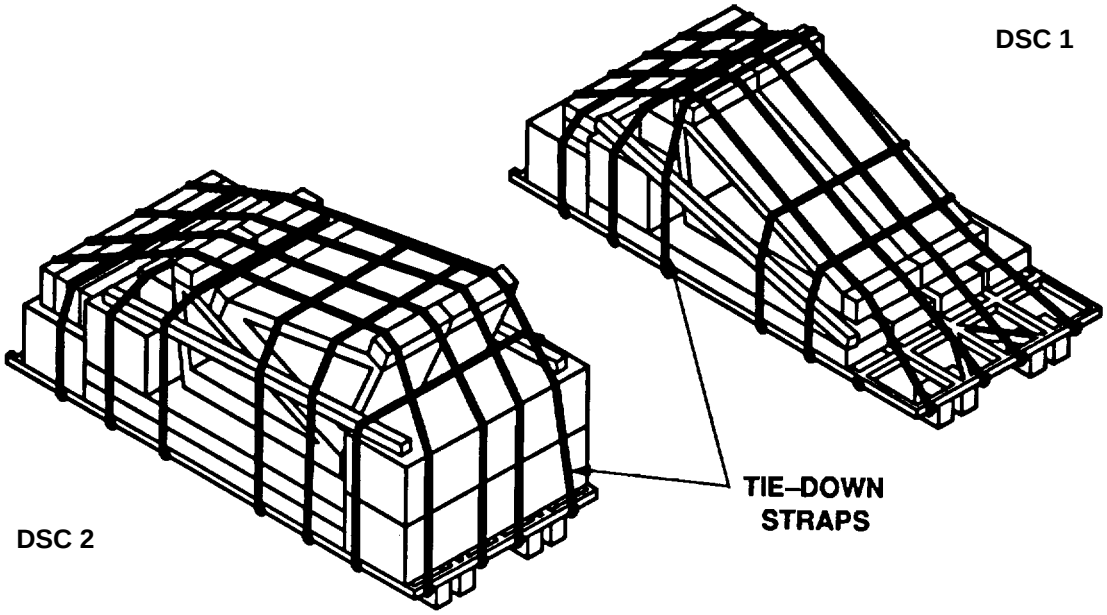
DSC 2

(15) Secure load with ten 10,000 lb cargo tie-down straps, (four lengthwise straps and six crosswise straps), as described in step a. (4).

Pallet Load DSC1.

(16) Secure load with nine10,000 lb cargo tie-down straps, (four lengthwise straps and five crosswise straps), as described in step a. (4).

NOTE
To unload the pallets, carry out the steps In reverse order.



3-108

3-21. PALLETIZATION - LINK REINFORCEMENT

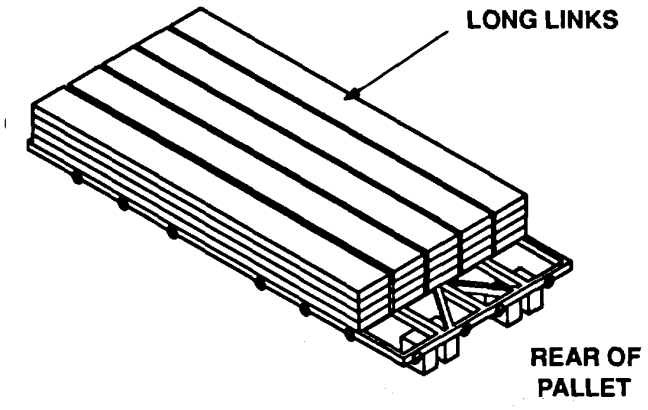
Link reinforcement components are carried on two pallets, LRS-1 and LRS-2. To load the pallets, perform the steps as described below.

a. Pallet Load LRS-1

(1) Place twenty long links on pallet in four layers of five links each.

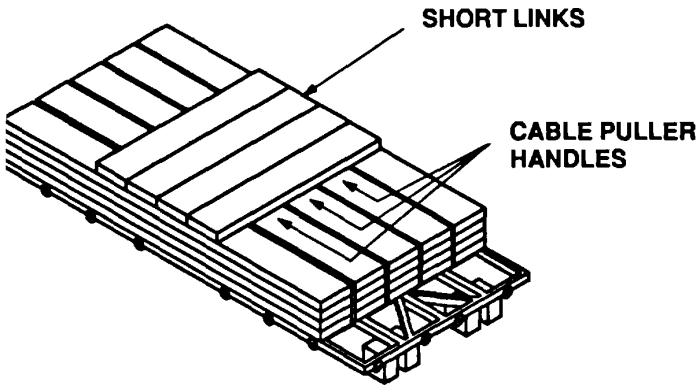
(a) The side flanges of the links must interlock with the previous layer. Flanges must not sit on top of each other.

(b) End of links shall be flush with front end of pallet.



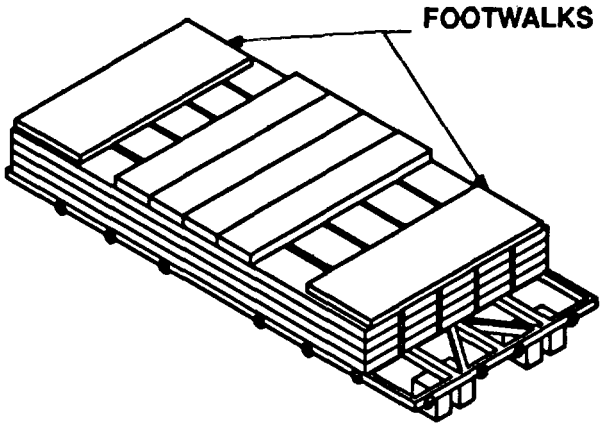
LRS 1

(2) Place four short links across long links, and four cable puller handles between the long links and short links. Short links shall be side by side and centered over long links.



LRS 1

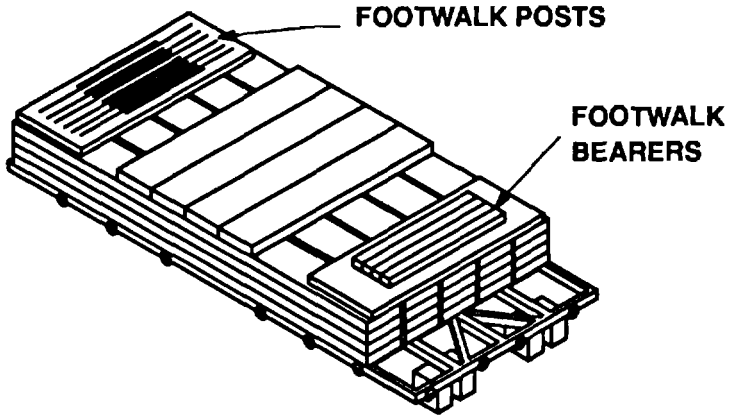
(3) Place two footwalks on top of long links. Both footwalks are placed on load upside down and at each end of links.



LRS 1

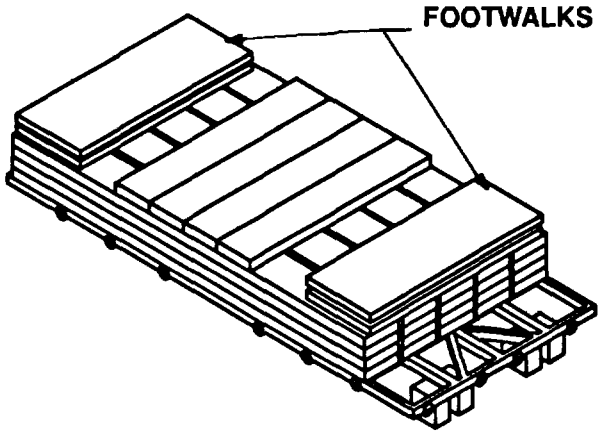
(4) Place ten footwalk posts in footwalk on front of load.

(5) Place four footwalk bearers in footwalk on rear of load.



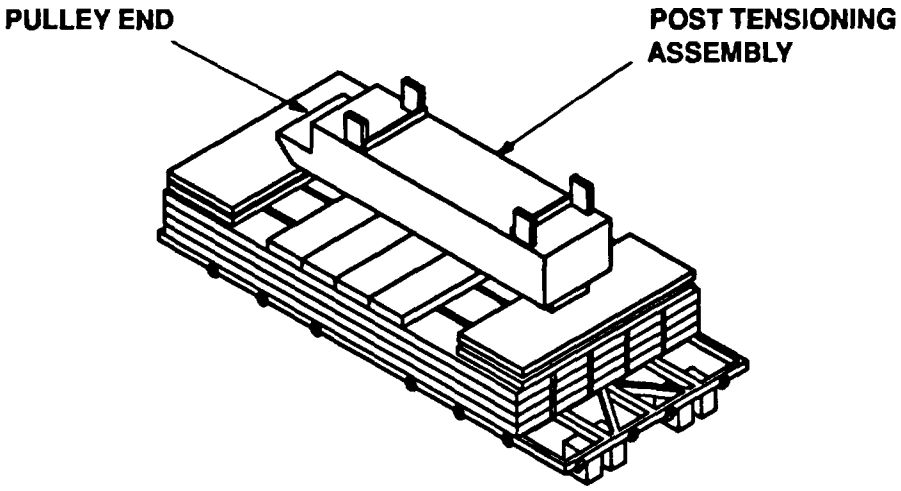
LRS 1

(6) Place two footwalks, right side up, on top of other footwalks.



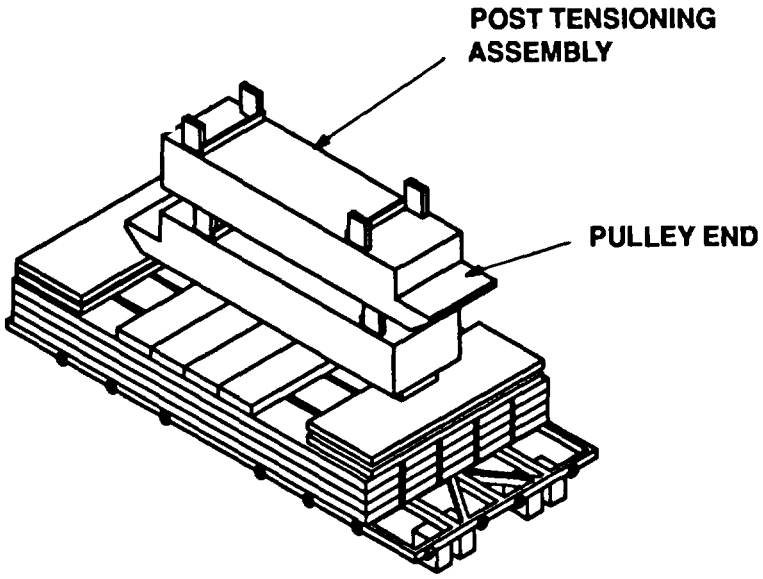
LRS 1

(7) Place one post tensioning assembly on top of short links and footwalks with pulley end of assembly facing front of pallet and centered over links.



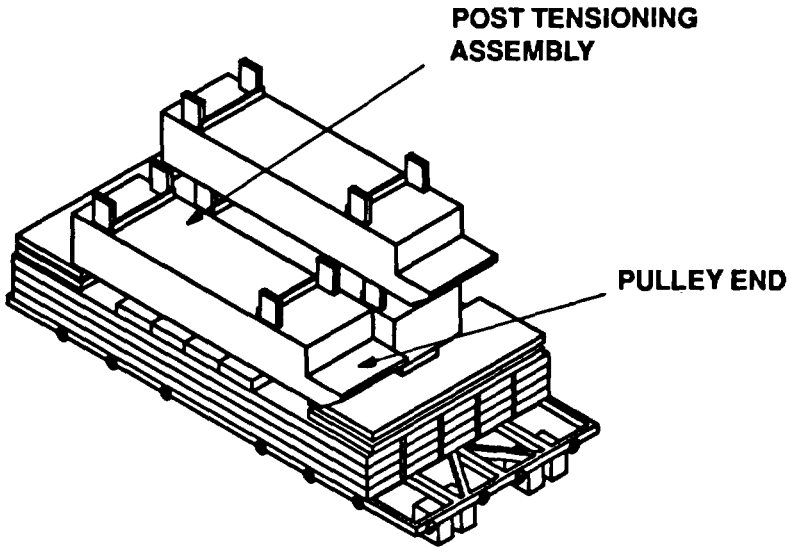
LRS 1

(8) Place one post tensioning assembly on top of first assembly with pulley end facing rear of pallet and centered over other assembly.



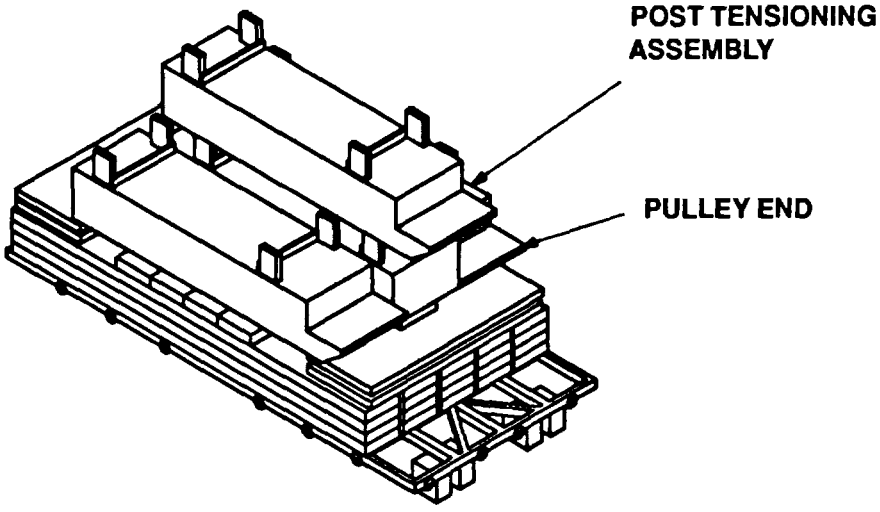
LRS 1

(9) Place one post tensioning assembly to one side of first assembly with pulley end facing rear of pallet. Ensure that assembly is tight against first assembly.



LRS 1

(10) Place one post tensioning assembly on other side of first assembly with pulley end facing rear of pallet. Ensure that assembly is tight against first assembly.

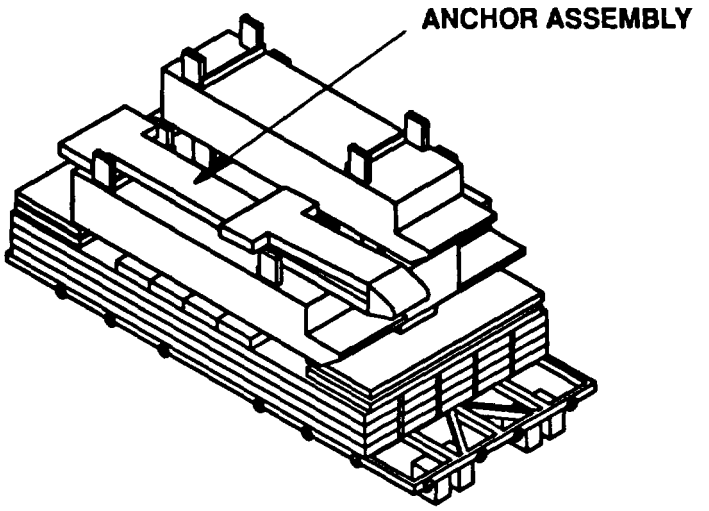


LRS 1

(11) Place one anchor assembly on top of tensioning assembly.

(a) Fork end anchors must be locked in transit position with bracing pins.

(b) Junction block faces rear of pallet.

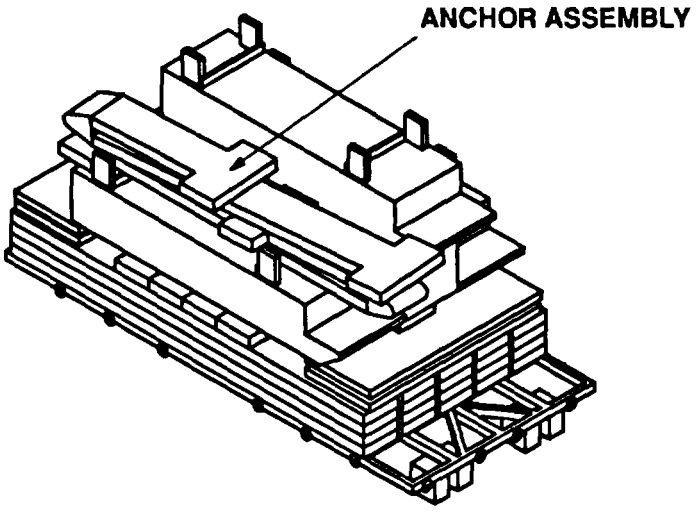


LRS 1

(12) Place one anchor assembly on top of first assembly.

(a) Fork end anchors must be locked in transit position.

(b) Junction block faces front of pallet.

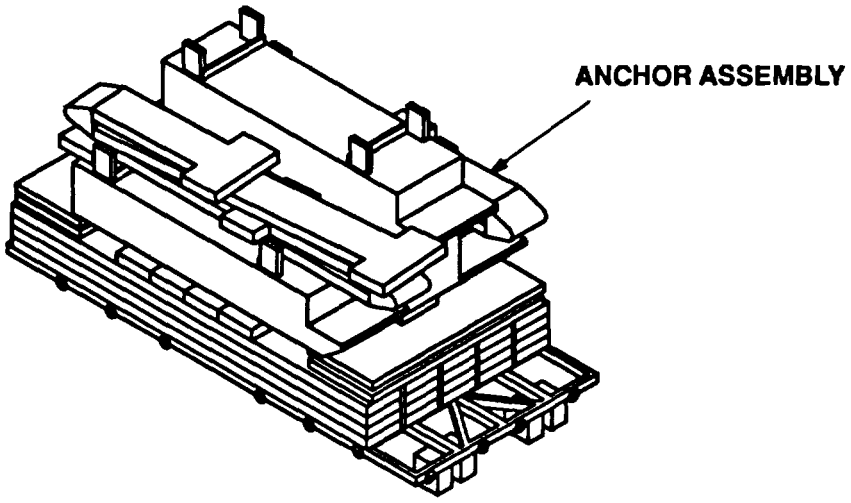


LRS 1

(13) Place one anchor assembly on top of tensioning assembly.

(a) Fork end anchors must be locked in transit position.

(b) Junction block faces rear of pallet.

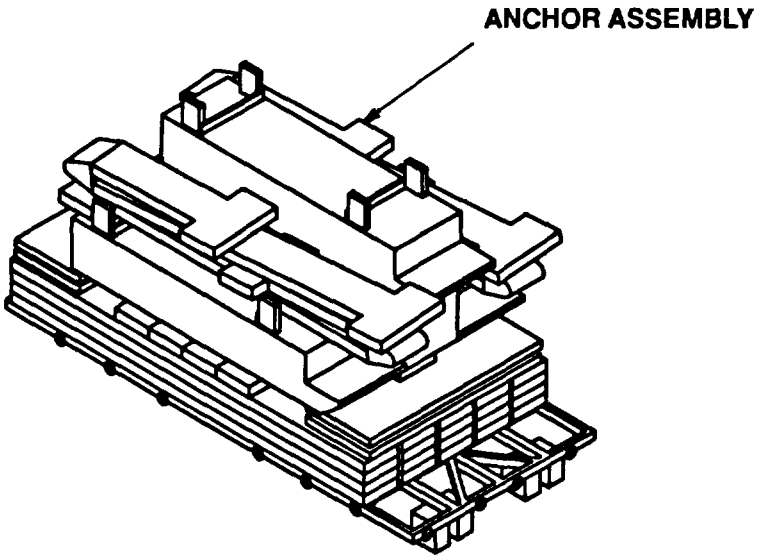


LRS 1

(14) Place one anchor assembly on top of first assembly.

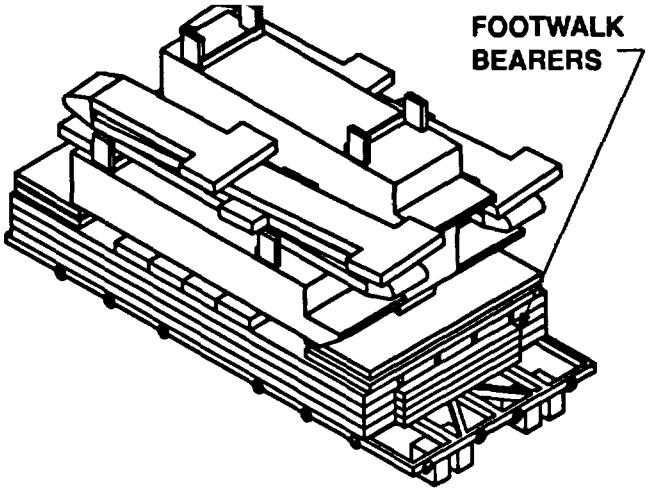
(a) Fork end anchors must be locked in transit position.

(b) Junction block faces front of pallet.



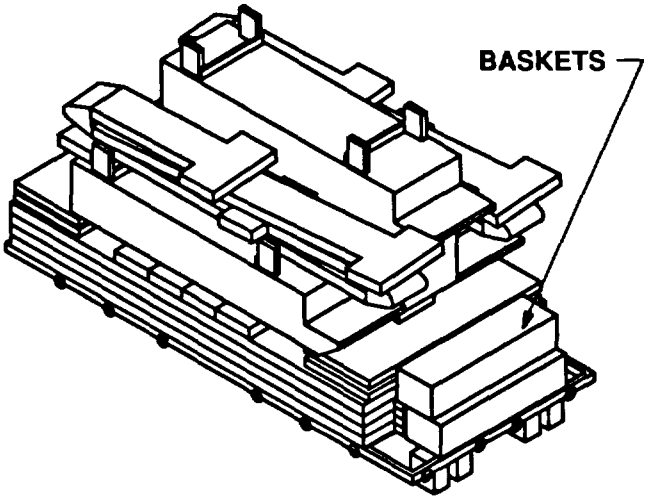
LRS 1

(15) Place four footwalk bearers on pallet behind log links.



LRS 1

(16) Place two baskets (LRS - A and B) on rear of pallet against footwalk bearers.



LRS 1

(17) Secure load with ten 10,000 lb cargo tie-down straps (four lengthwise straps and six crosswise straps).

(a) Place lengthwise straps over pallet load.

(b) The strap’s ratchet assembly is placed to rear of pallet.

(c) Hook straps to shackles.

(d) Tighten straps.

(e) Place crosswise straps across pallet load.

(f) The strap’s ratchet assembly is placed on right side of pallet.

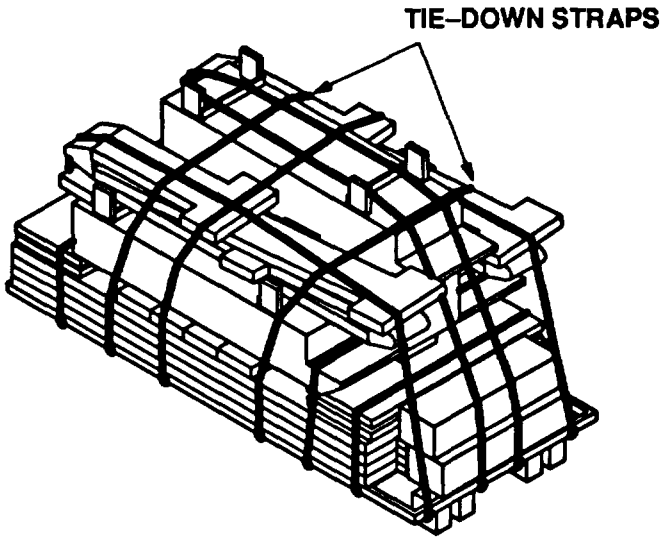
(g) Hook straps to shackles.

(h) Tighten straps.

(i) Tie rubber bumper across pallet load near rear of load.

(j) Roll or wrap excess strap in a neat manner.

NOTE
To unload the pallet, carry out the preceding steps In reverse order.



LRS 1

b. Pallet Load LRS-2

(1) Place four launching nose heavy sections and two baseplates on pallet.

(a) Interlock baseplates with their dowel pins facing each other.

(b) Stand baseplates on their long edge flush with front of pallet.

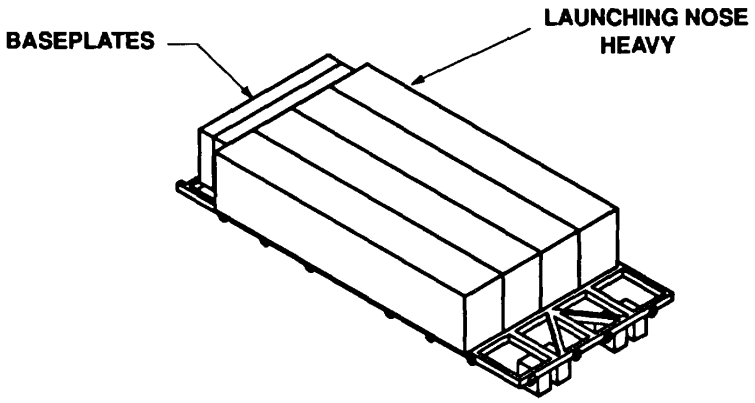
(c) Ends of nose sections butt up against baseplates.

(d) Sides of outside nose sections are placed flush with edge of pallet.

(e) Inside nose sections are aligned with outer nose sections.

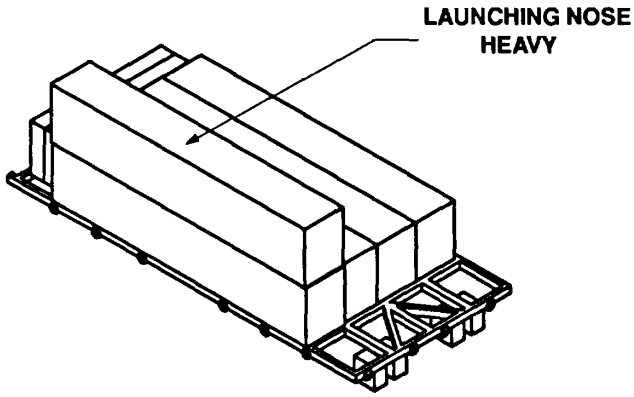
(f) Place hydraulic jacks upright in outer nose section. Jacks should be placed against center vertical and tied securely to it with rope.

CAUTION
Maintain jacks In an upright position to reduce leakage and damage to seals.



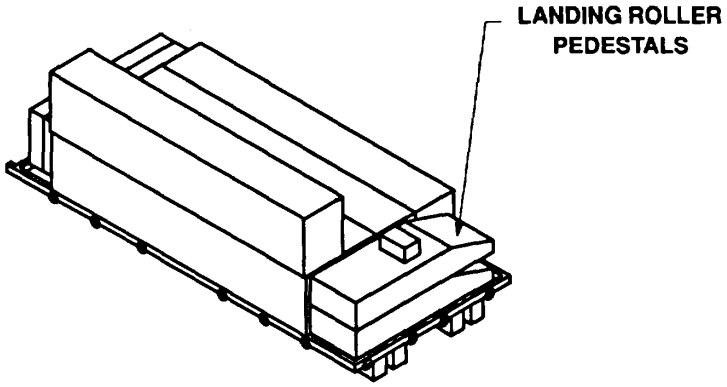
LRS 2

(2) Place a launching nose heavy section on top of nose sections as shown.



LRS 2

(3) Place two landing roller pedestals (Mk2), one on top of the other, to rear of nose sections.

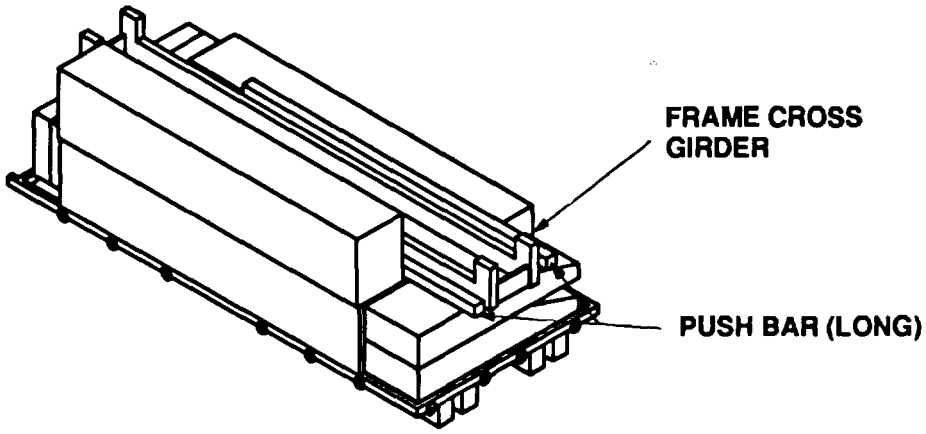


LRS 2

(4) Place a frame cross girder next to launching nose with one push bar (long) on each side of frame cross girder.

(a) Insert bracing pin through end of each push bar ready for step (11).

(b) Insert retainer clip through bracing pin.



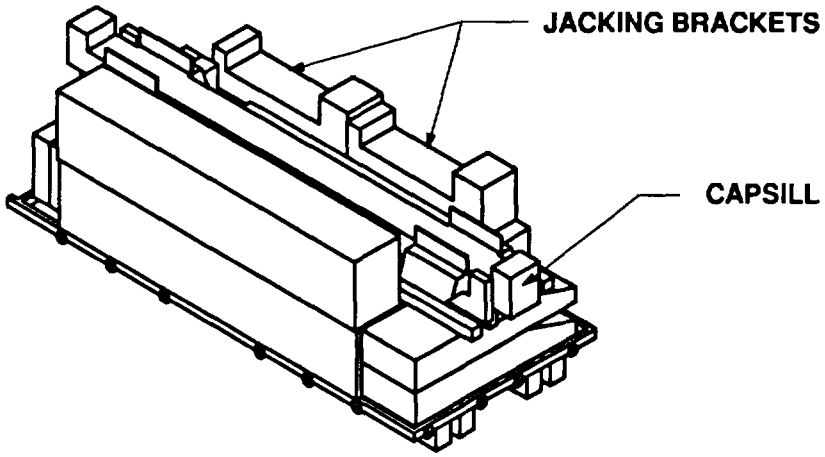
LRS 2

(5) Place capsill and jacking brackets on load.

(a) Place capsill centrally on frame cross girder with capsill inside frame cross girder side members.

(b) Ensure front end of capsill is flush with front end of pallet.

(c) Ensure the pulley end of jacking brackets face each other and pulleys face up.

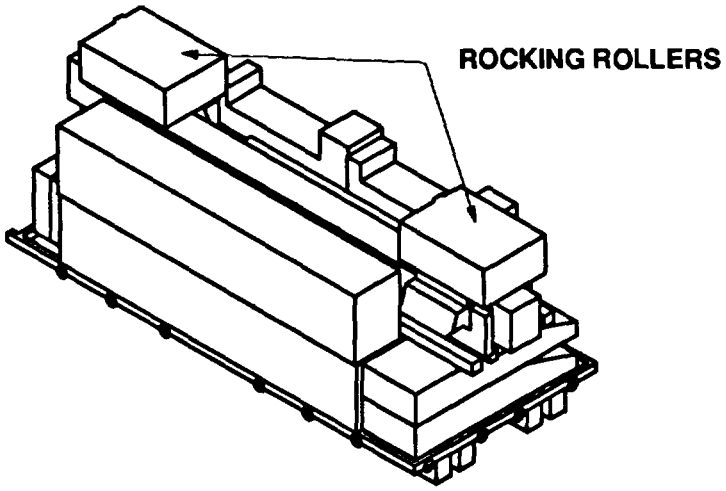


LRS 2

(6) Place two rocking rollers on capsill.

(a) Ensure that rollers are pinned to capsill with nose pins and secured with retainer clips.

(b) Ensure that rollers are in down (locked) position.

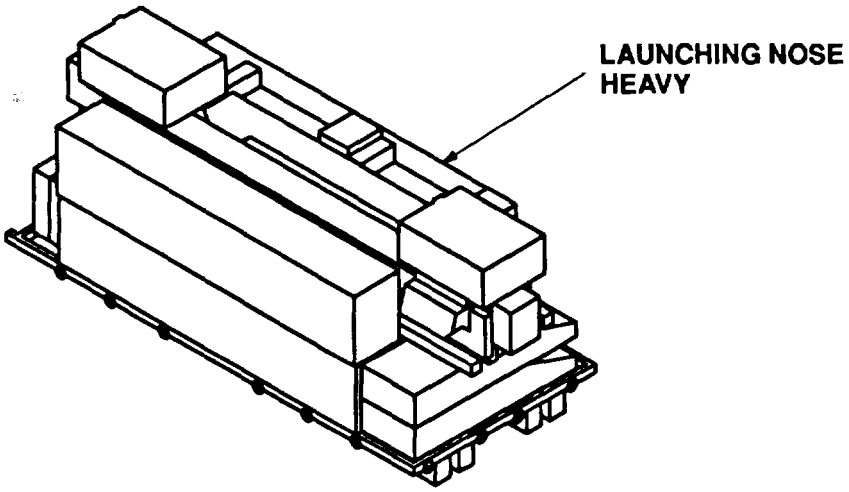


LRS 2

(7) Place a launching nose heavy section next to jacking brackets.

(a) Side of nose section to be flush with edge of pallet and nose section below.

(b) Ends of nose section to be in line with other nose sections.

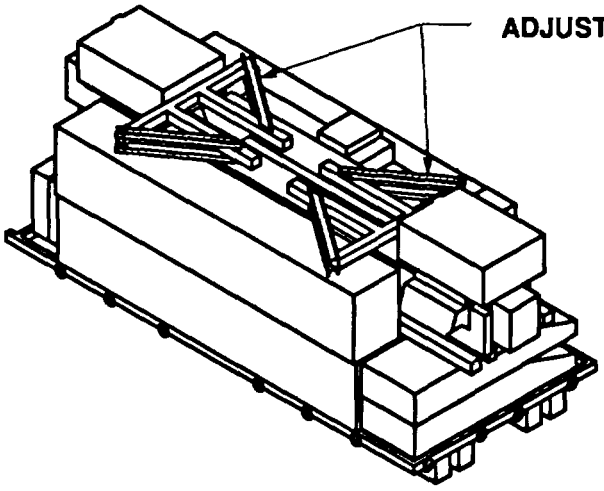


LRS 2

(8) Place two adjustable supports on top of capsule and launching noses.

(a) Bases of adjustable supports to face rocking rollers.

(b) Adjustable supports to be centered on load

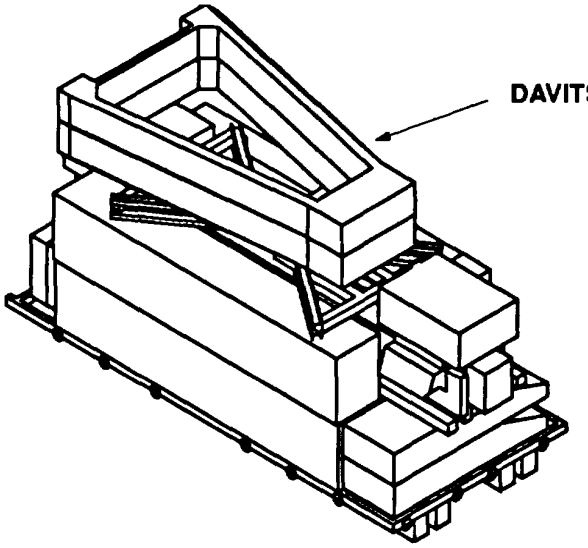


LRS 2

(9) Place two davit posts on top of rocking rollers and adjustable supports as shown.

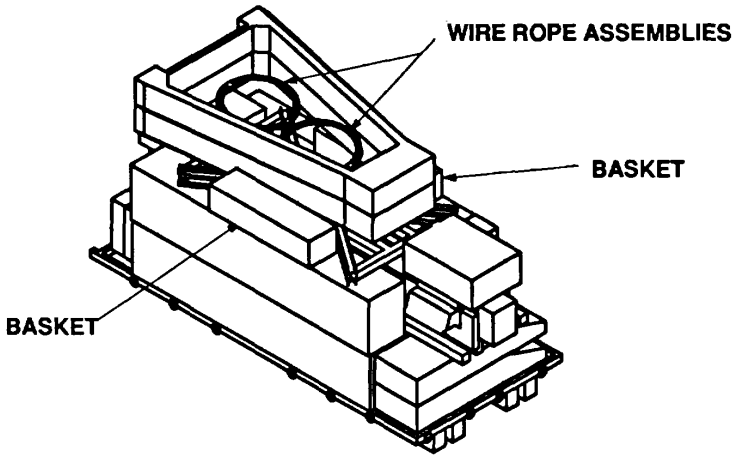
(a) Use packing (3in x 8in x 36in) between davit and rocking rollers.

(b) Use packing (3in x 8in x 36in) between davits to prevent damage to pulleys.



LRS 2

(10) Place two baskets (LRS C and D) on top of launching nose sections one each side of davits. Place two wire rope assemblies inside davits.

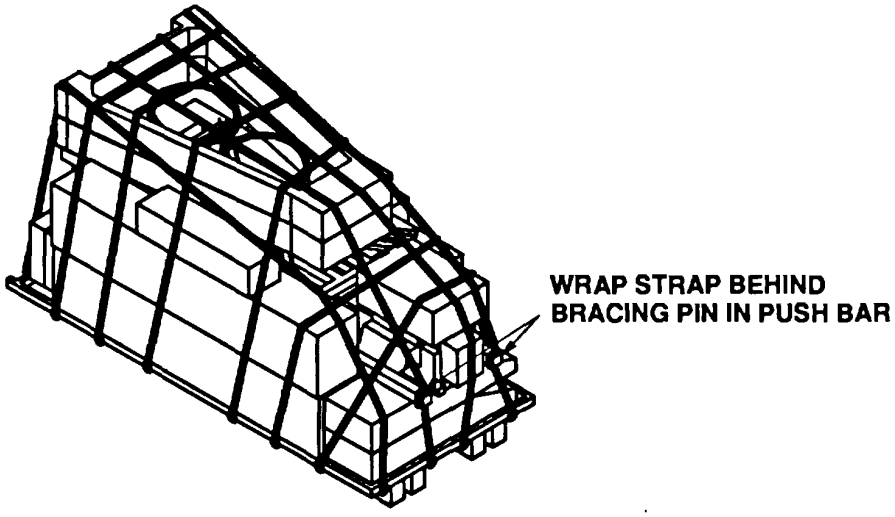


LRS 2

(11) Secure load with ten 10,000 LB cargo tie-down straps (four lengthwise straps and six crosswise straps).

(a) Place lengthwise straps over pallet load. Two straps are wrapped behind bracing pins in ends of push bars.
(b) The strap's ratchet assembly is placed to rear of pallet.
(c) Hook straps to shackles.
(d) Tighten straps.
(e) Place crosswise straps across pallet load.
(f) The strap's ratchet assembly is placed on right side of pallet.
(g) Hook straps to shackles.
(h) Tighten straps.
(I) Tie rubber bumper across pallet load near rear of the load.
(j) Roll or wrap excess strap in a neat manner.

NOTE
To unload the pallet, carry out the preceding steps In reverse order.



3-22. PALLETIZATION - SPARES PALLETS

Spares pallet loads contain the components that remain after the pallets required to complete the mission are loaded.

These pallets are loaded as needed to get all the components of the sets onto pallets ready for loading on trucks and trailers.

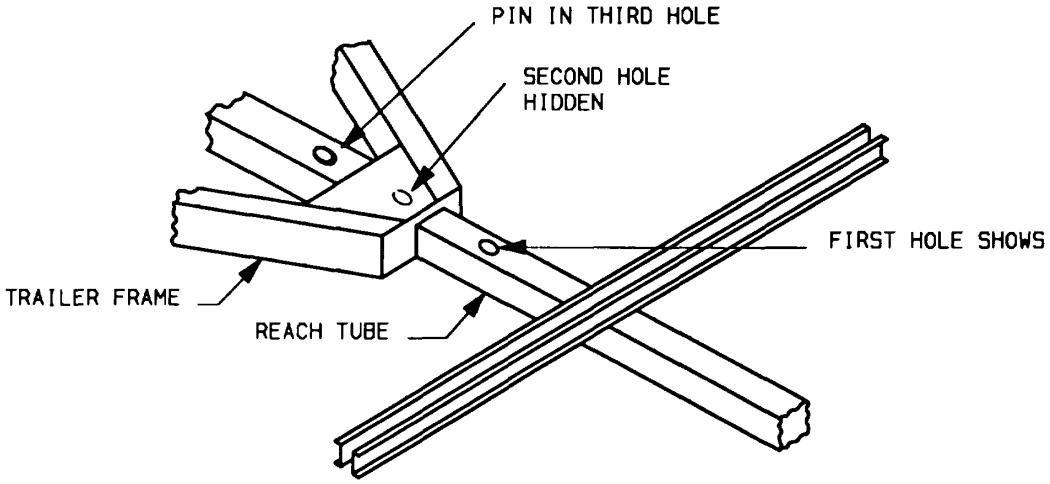
There are no basic spares loads as the variations are many. It is recommended that spares loads be put together in such a way that they can be changed to another type of load with as little change as possible, without exceeding the pallet, truck and lifting sling capacities.

3-23. LOADING PALLETS ON TRANSPORT VEHICLES

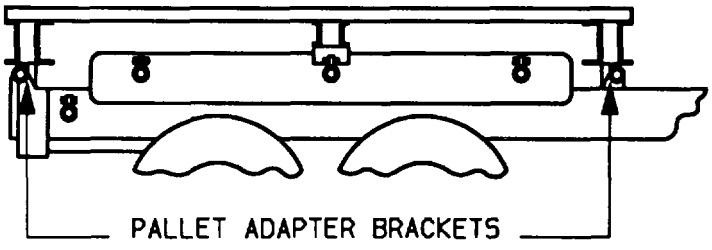
The procedures for loading pallets on trucks and trailers are the same for all loads.

a. Loading Pallets on Trailer

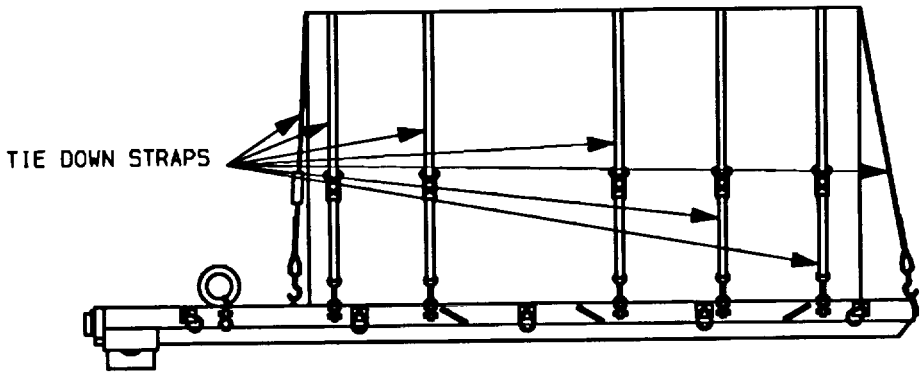
(1) Check to see that reach tube of trailer has been extended and pinned in third hole.



(2) Check pallet adapter brackets to see that they are securely bolted to adapter.



(3) Check to see that all load restraining straps are in place and properly tightened.

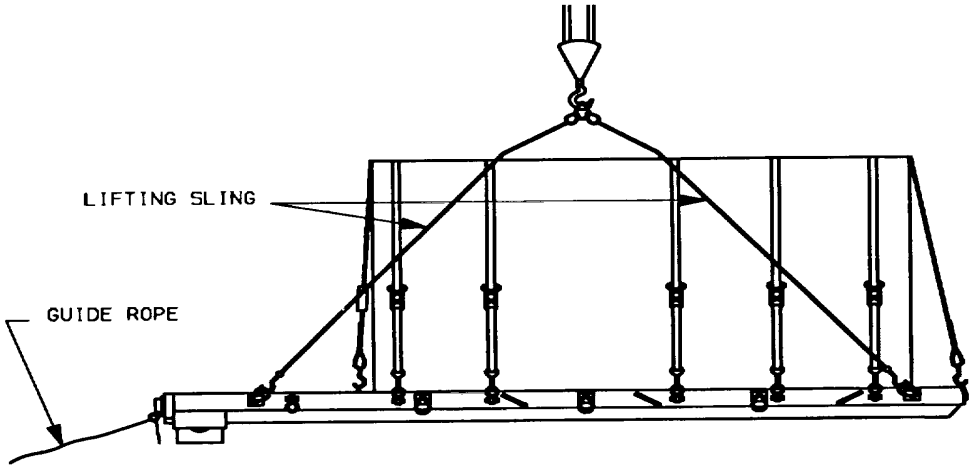


(4) Attach center ring of lifting sling to crane hook.

(5) Raise sling until four hook ends of sling are a few inches off ground.

(6) Attach four hooks of sling to four lifting rings of pallet.

(7) lowly raise lifting sling until lines are taut.

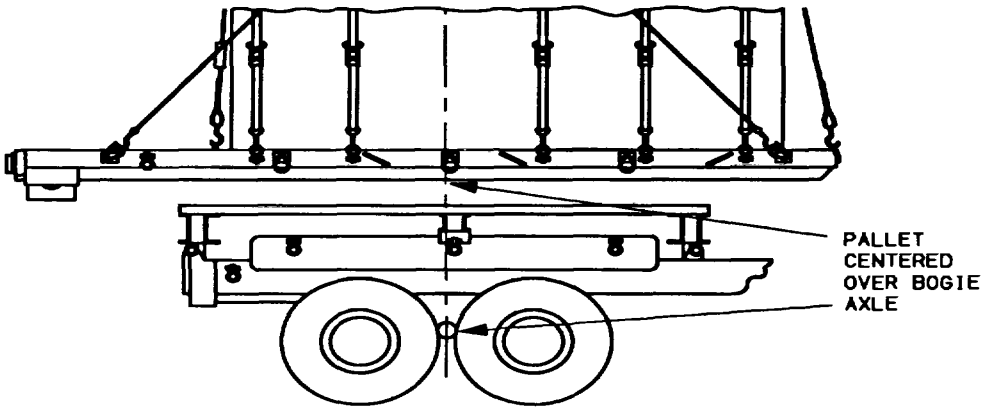


(8) Attach one guide rope to each side of pallet at bumper end. One person is to man each of the guide ropes.

(9) Raise pallet until it is higher than trailer.

(10) Move pallet over trailer bed and use guide ropes to center pallet over adapter.

(11) Move pallet so that pallet center is directly over trailer bogie (center between wheels).



(12) Lower pallet slowly onto adapter.

(13) Lower lifting sling and disconnect it from pallet.

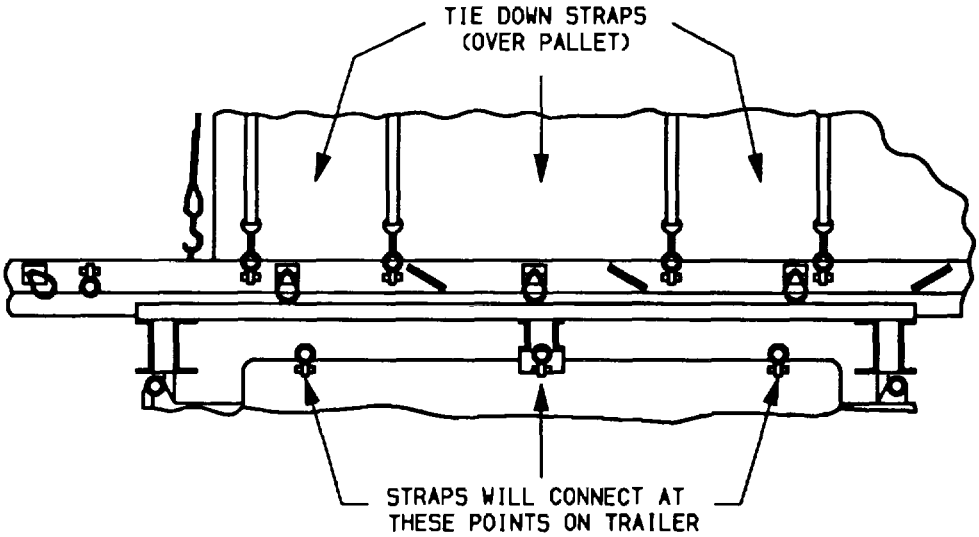
(14) Remove guide ropes from pallet.

b. Securing Pallets on Trailer

WARNING

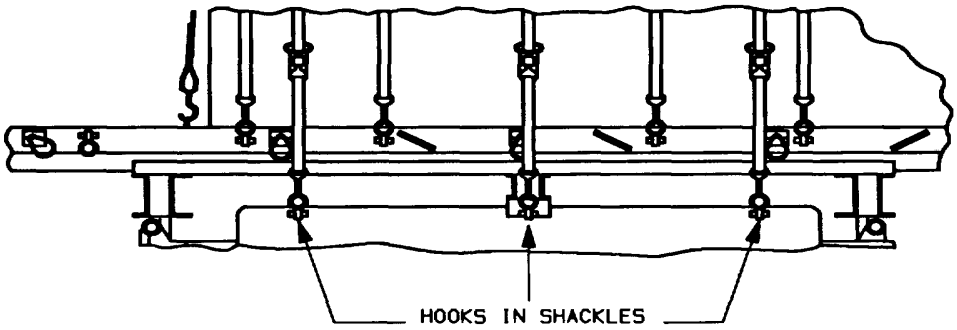
Be sure all personnel are clear before throwing straps across load. To avoid damage to the ratchet, do not throw ratchet end of strap across load.

(1) Place three restraining straps across pallet load at equal spaces and locate all strap ratchets on curb side of trailer.



(2) Hook straps in shackles on road side of trailer and pull straps from curb side of trailer to tighten.

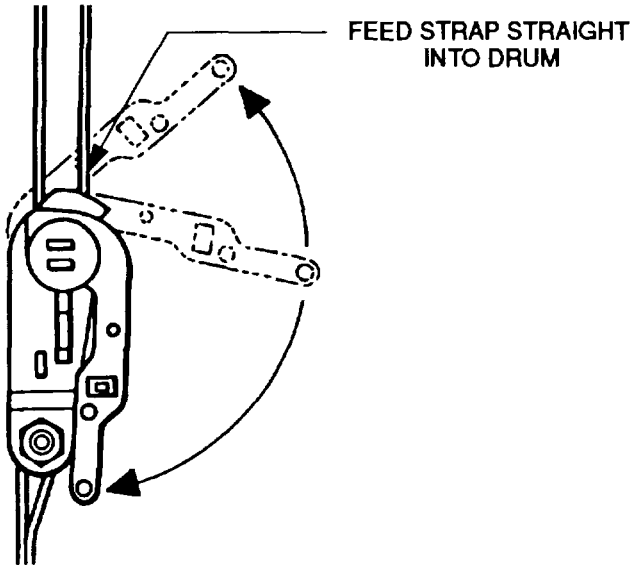
(3) Place hook in shackles on curb side of trailer.



(4) Pull free end of strap at ratchet to take up slack.

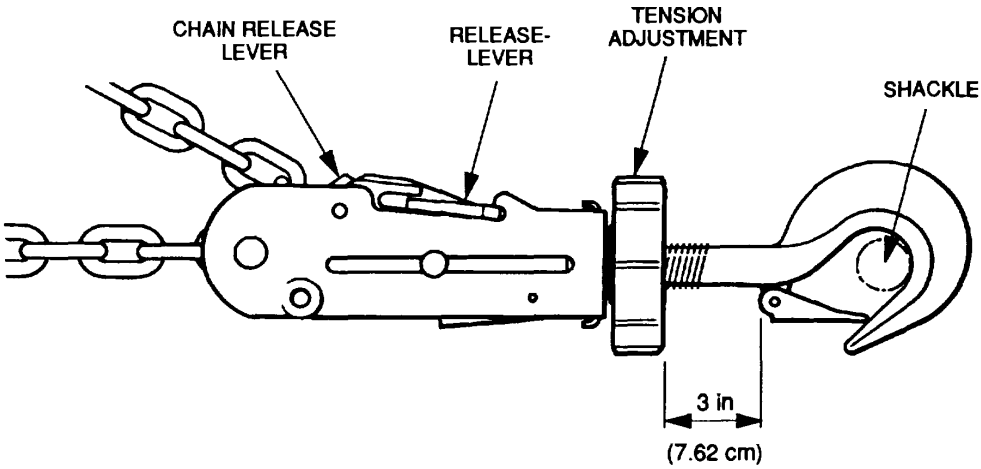
(5) Tighten strap (hand tight only) by operating ratchet handle.

(6) Ensure that strap is fed straight into drum when tightening.



CAUTION
Ratchet may be damaged If mechanical means are used to operate ratchet handle.

(7) Hook an anchor chain ratchet to large shackle on each side of trailer at rear; open part of hook faces down.

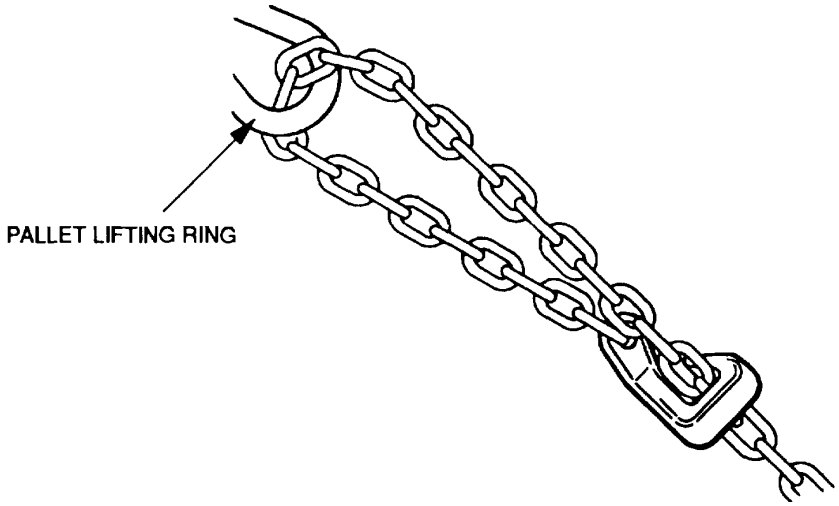


(8) Pull up release lever on ratchet assembly and turn tension adjustment until hook is extended about 3 in (7.62 cm).

(9) Release chain from ratchet by pressing chain release lever down.

(10) Put hook end of chain through pear shaped lifting ring at rear of pallet. (The extractor end of the pallet is considered the rear).

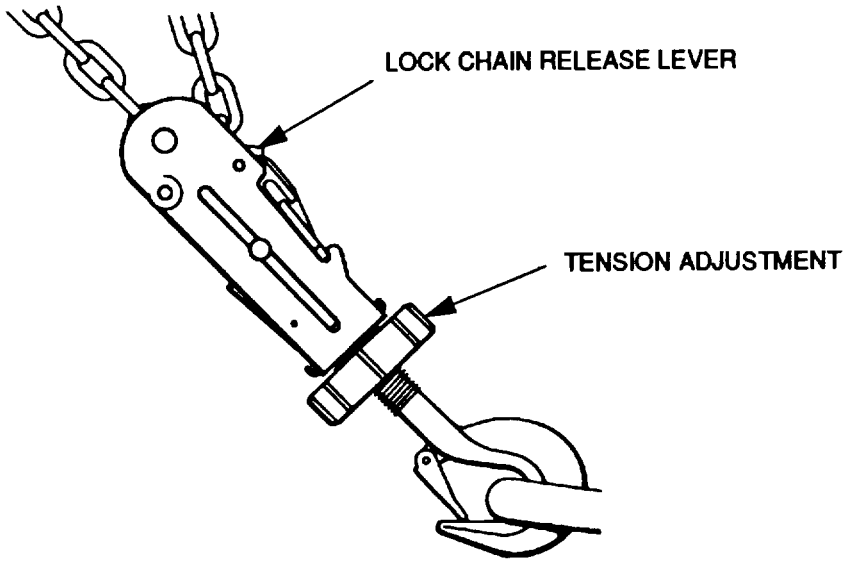
(11) Hook chain back on itself.



1574

(12) Pull chain tight and attach it to chain ratchet assembly

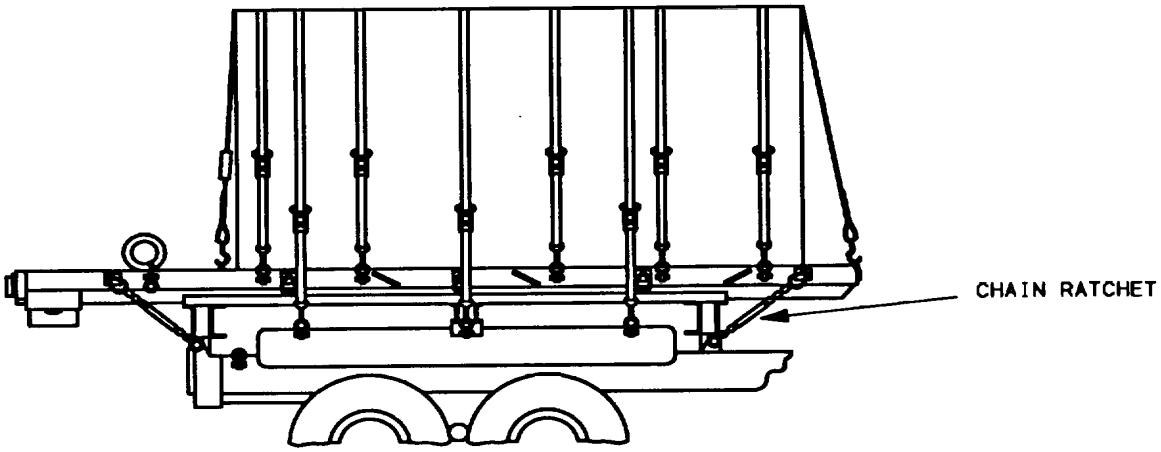
(13) Lock chain release lever [unlocked in step (9)].



(14) Turn tension adjustment until chain is tight; hand tighten only.

NOTE
The hook on the ratchet assembly can be tightened without pulling up the release lever.

(15) Attach anchor chain ratchet to front of pallet. Use procedures outlined in steps (7) thru (14), except that in step (7) chains are run under pallet and attached to 10,000 LB (4540 kg) tie-down eyes at front of pallet.



c. Loading Pallet on Truck

To load pallet on truck, perform the following steps in a similar manner as they were performed to load the trailer.

NOTE

The tailgate of the truck can be removed and stored before loading pallets on the truck. One method of keeping the tailgate with the truck Is to bolt It to the head board of the truck.

(1) Check to see that all load restraining straps are in place and properly tightened.

(2) Attach center ring of lifting sling to crane.

(3) Raise sling until four hook ends of sling are a few inches off ground.

(4) Attach four hooks of sling to four lifting rings of pallet.

(5) Slowly raise lifting sling until lines are taut.

(6) Attach one guide rope to each side of pallet at bumper end. One person is to man each of the guide ropes.

(7) Raise pallet until it is higher than sides of truck body.

(8) Move pallet over truck body.

(9) Use guide ropes to center pallet over truck body.

(10) Move pallet to front of truck body.

(11) Slowly lower pallet onto truck bed.

(12) Lower lifting sling and disconnect it from pallet.

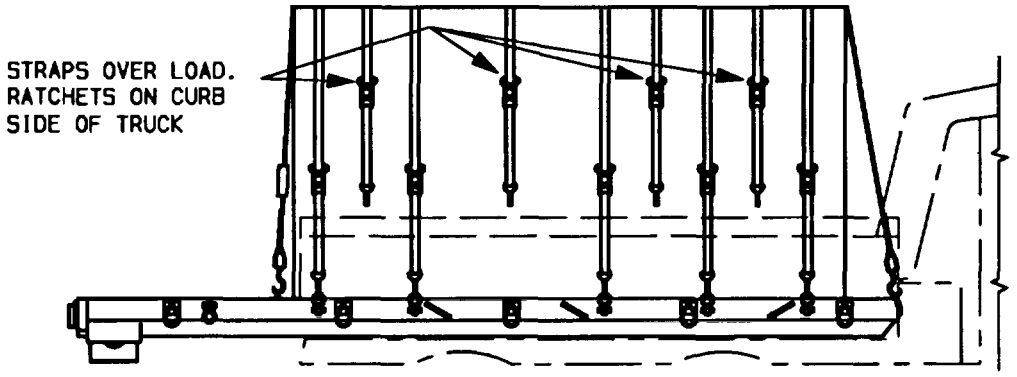
(13) Remove guide ropes from pallet.

d. Securing Pallet on Truck

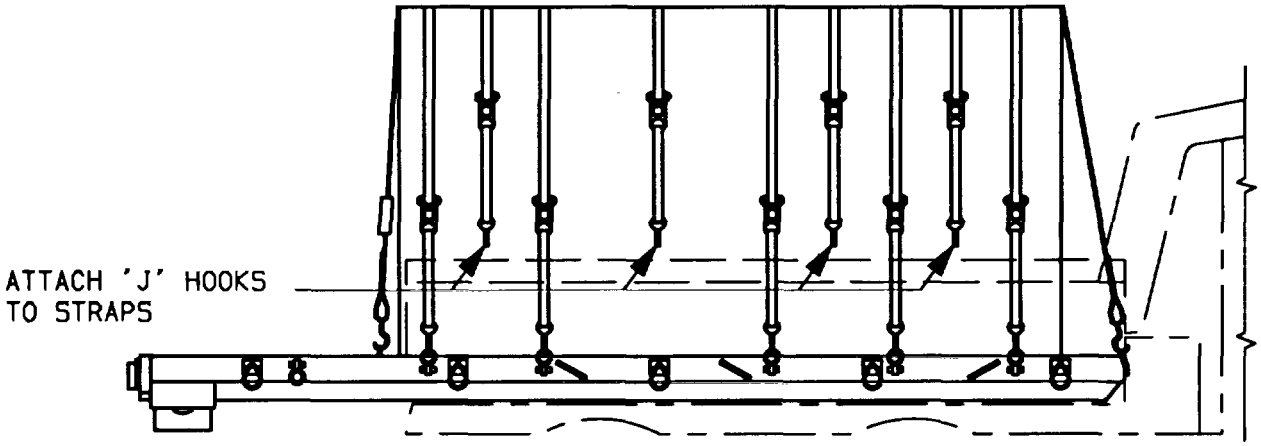
WARNING

Be sure that all personnel are clear before throwing straps across the load. To avoid damage to the ratchet, do not throw ratchet end of strap across load.

(1) Place four straps (5,000 LB) across pallet load at equal spaces with the strap ratchets located on curb side of truck.



(2) Attach "J" hooks to each end of straps.



(3) Tighten one strap at a time as follows:

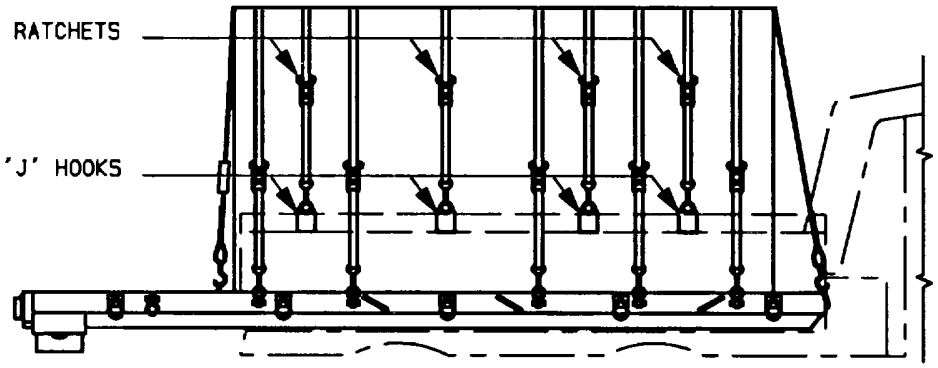
(a) Pull on strap from ratchet side of strap while "J" hook on the opposite side is being positioned so that it will hook on truck bed.

(b) Pull free end of strap at ratchet to take up slack while "J" hook on ratchet side of strap is being positioned to hook on side of truck bed.

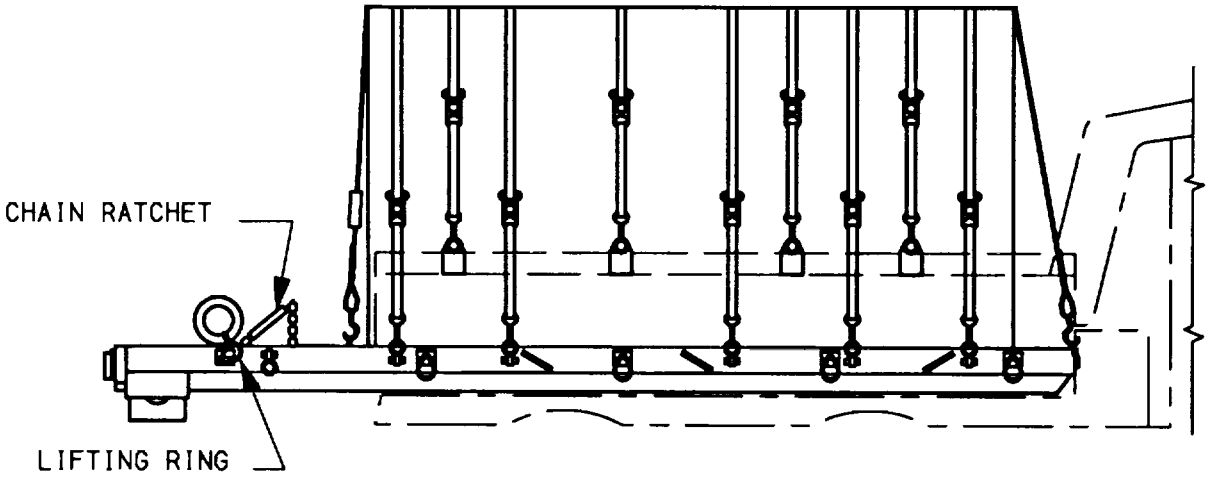
CAUTION

The ratchet may be damaged If mechanical means are used to operate the ratchet handle.

(c) Tighten strap (hand tight only) by operating ratchet handle.



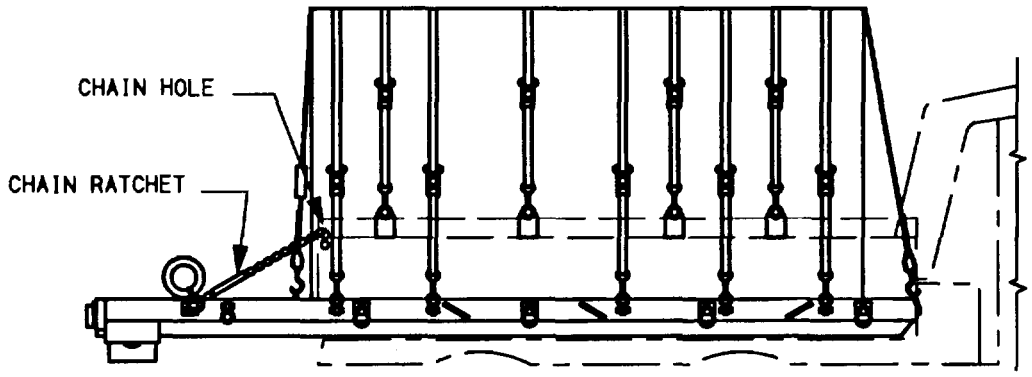
(4) Hook an anchor chain ratchet assembly to each pear link lifting ring at rear of pallet. The extractor end of the pallet is considered the rear.



(5) Press tension release lever on underside of ratchet assembly and turn tension adjustment until hook is extended about 3 in (7.62 cm).

(6) Release chain from ratchet assembly by pulling chain release lever down and away from ratchet.

(7) Hook one end of chain in tailgate chain hole in dump truck body.



(8) Pull chain tight and attach it to chain ratchet assembly.

(9) Relock chain release lever [released in step (6)].

(10) Turn tension adjustment until chain is tight; hand tighten only.

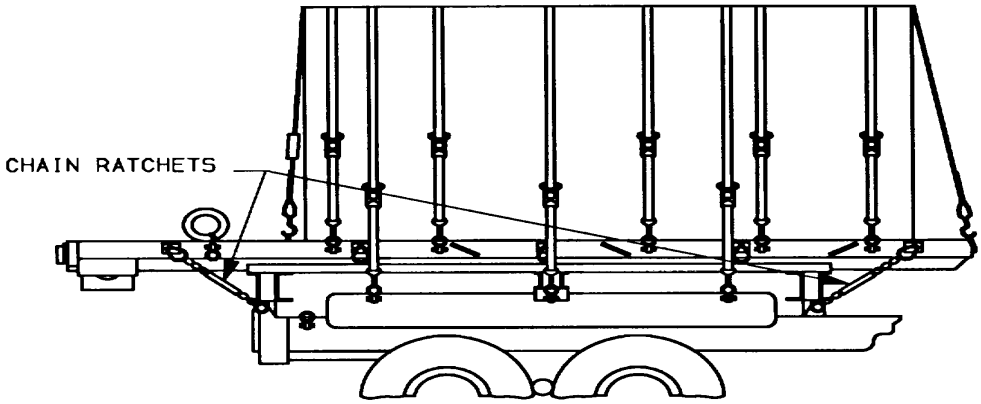
NOTE
The hook on the ratchet assembly can be retracted without pulling up the release lever.

3-24. OFF-LOADING PALLETS FROM TRANSPORT VEHICLES

The procedures for off-loading pallets from trucks and trailers are the same for all loads.

a. Off-Loading Pallets from Trailer

(1) Release four anchor chains by pulling up and out on chain release levers.

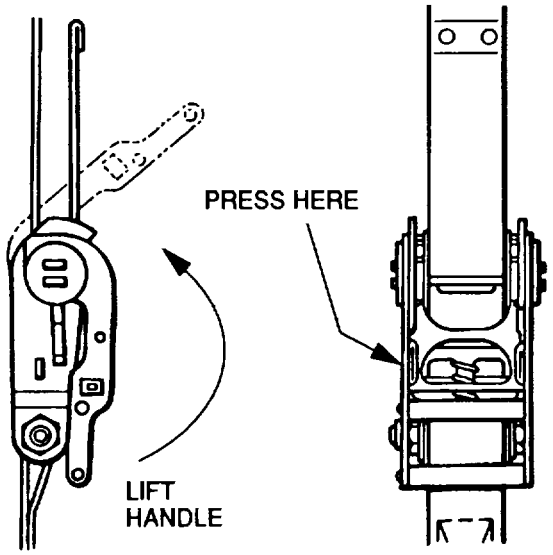


(2) Remove chains from pallet and remove chain ratchet assemblies from trailer. Store them in a safe place to prevent damage or loss.

(3) Remove rubber bumper from pallet; place on the ground behind rear wheels.

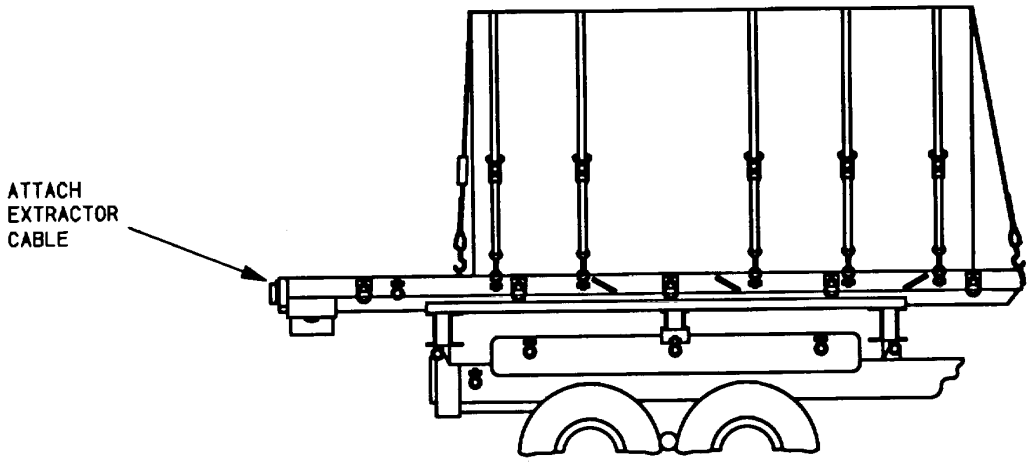
(4) Release the straps which secure pallet to the trailer as follows:

(a) Hold ratchet handle and press down on handle center lever with thumb.



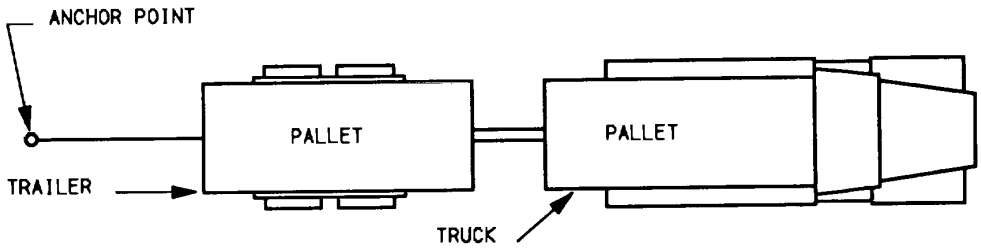
(b) Lift up handle until ratchet releases tension on straps.

(c) Remove straps from pallet. Store the straps in a safe place to prevent damage or loss.



(5) Attach extractor cable to pallet extractor bracket.

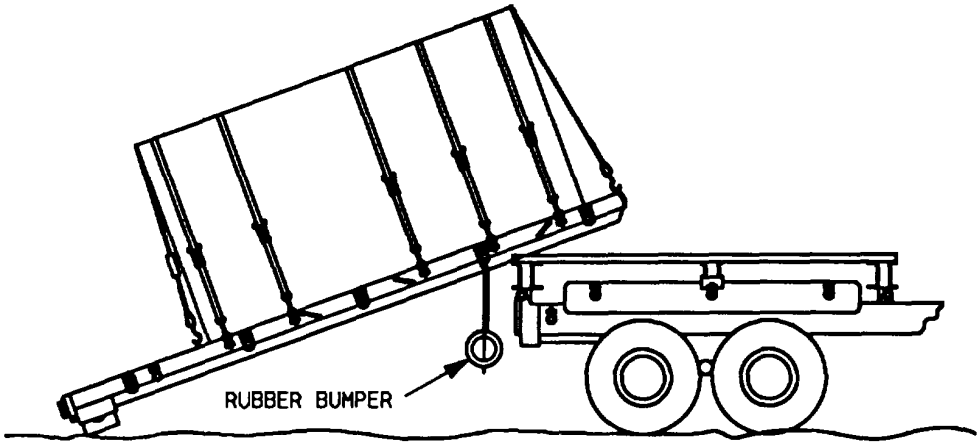
(6) Attach other end of extractor cable to an anchor point behind and in line with truck/trailer combination.



(7) Move trailer forward until extractor end of pallet hits ground.

(8) Connect rubber bumper under high end of pallet as close to trailer as possible.

WARNING
DO NOT go under pallet.



NOTE

One person on each side of pallet should pull toward the trailer on the free ends of the bumper assembly rope.

(9) Move trailer forward, letting pallet fall to ground.

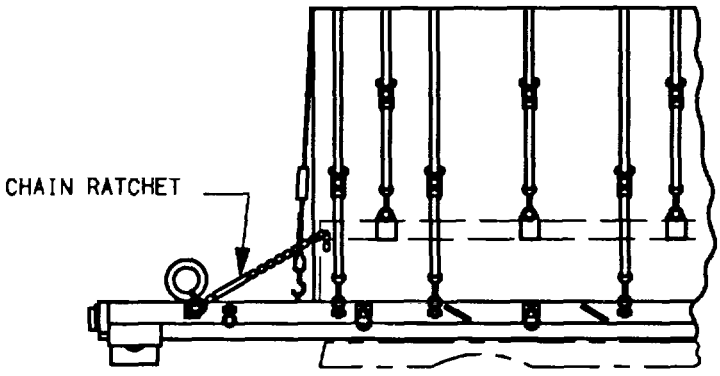
(10) Disconnect extractor cable. Store cable to prevent loss or damage.

(11) Move trailer away from bridge building area.

b. Off-Loading Pallets from Truck

The pallet can be removed from the truck with the aid of an extractor cable, or by dumping the extractor end the pallet on the ground. If the pallet is dumped, omit steps (5) and (6) of the following procedures. If an extractor cable is used, perform all steps of the procedure.

(1) Release two anchor chains by pulling down and out on chain release levers.

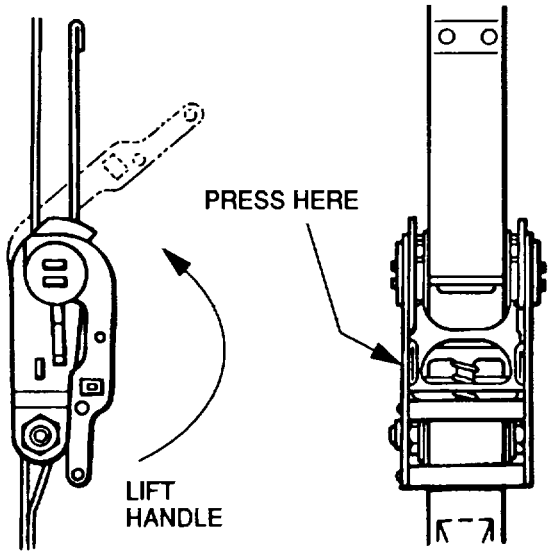


(2) Remove chains from truck; store chains in a safe place to prevent damage or loss.

(3) Remove rubber bumper from pallet.

(4) Release straps which secure pallet to truck as follows:

(a) Hold ratchet handle and press down on handle center lever with thumb.

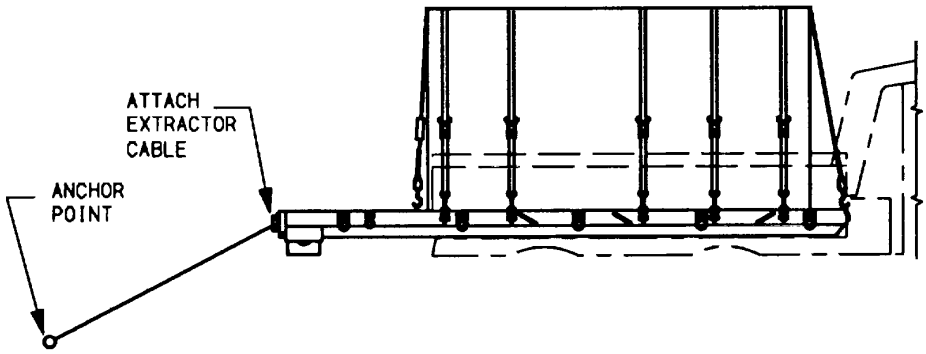


(b) Lift up handle until ratchet releases tension on straps.

(c) Remove straps from pallet; store straps in a safe place to prevent damage or loss.

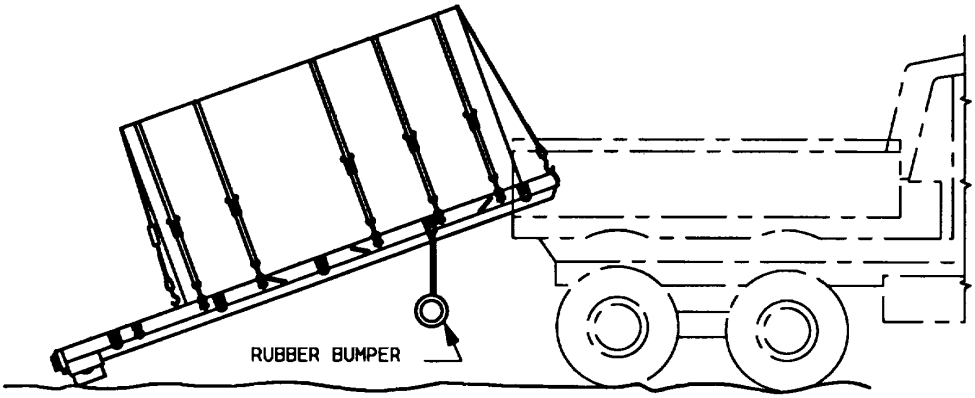
(5) Attach extractor cable to pallet extractor bracket.

(6) Attach other end of extractor cable to an anchor point behind and in line with truck.



(7) Move truck forward or raise dump body until extractor end of pallet hits ground

(8) Connect rubber bumper under high end of pallet as close to truck as possible.



NOTE

One person on each side of the pallet should pull toward the truck on the free ends of the bumper assembly rope.

(9) Drive truck forward letting pallet fall to ground.

(10) Disconnect extractor cable (if used) and drive truck away from building area.

c. Off-loading on Normal Sites

The procedures below should always be followed when off-loading on normal sites.

(1) Ensure that the pallets are dropped so that they are never closer than 22 ft (6.7 m) to the center line.

(2) Pallets should be off-loaded in the order in which they are needed for construction. For example, the pallet containing the erection and launch components is always off-loaded first, to one side of centerline, near the edge of the gap.

(3) Use the dump trucks, or other unit vehicles as anchorages for off-loading trailers.

(4) Drive trucks and trailers straight on and off site. Avoid backing them.

(5) Disconnect trailers in an area clear of the site, and have trucks return for off-loading.

(6) After dropping the erection load, this pallet can be unstrapped and the building frame erected. Then as further pallets are dropped, they can be unstrapped ready for construction to maintain concurrent activity.

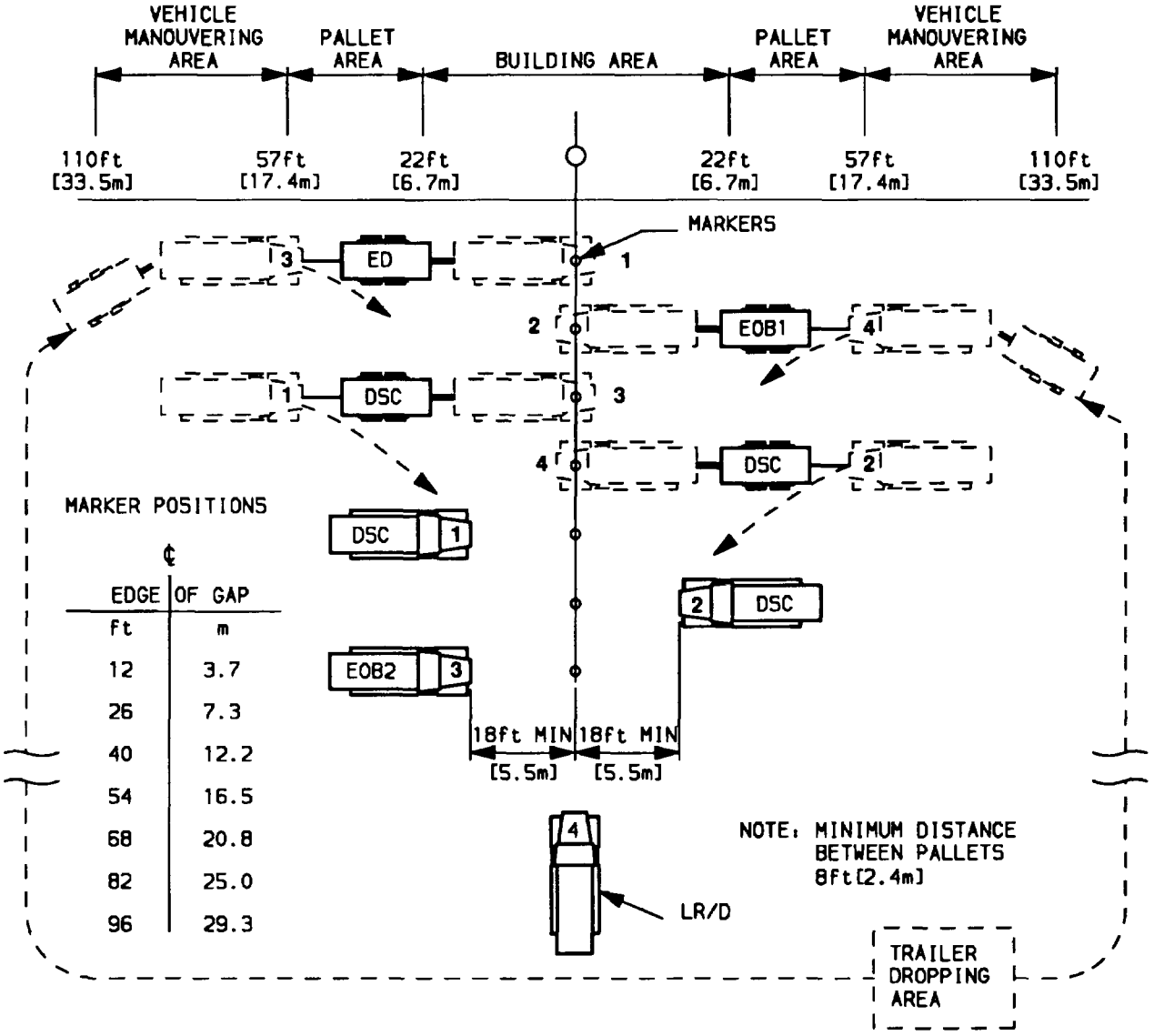
CAUTION

Do not use the bridge as an anchorage to off-load ramp and deck loads.

EXAMPLE

The following is an example of off-loading a 2E + 12 bay on a normal site. The truck and trailer loading in this example is as follows:

TRUCK #	***Load***	***Trailer #***	***Load***
1	*DSC*	*1*	*ED*
2	*DSC*	*2*	*EOB1*
3	*EOB2*	*3*	*DSC*
4	*LR/D*	*4*	*DSC*



(a) Mark out bridge center line as shown on diagram (marker positions).

(b) Drive Truck 1 onto site and stop in position over marker.

NOTE
Minimum distance between pallets should never be less than 7.9ft (2.4 m).

(c) Drive truck 3 onto site to stop in position behind ED Load (Trailer 1) to act as anchorage for off-loading.
(d) Drive Truck 2, in from opposite side of center line and stop over marker, then drive Truck 4 in behind EOB 1 Load (Trailer 2) to act as anchorage.
(e) Off-load ED and EOB 1 then drive trucks and trailers to the dropping-off area.
(f) Maneuver Trucks 3 and4, with trailers, into positions shown and drive Trucks I and2 into position behind DSC Loads (Trailers 3 and 4) as anchorages.
(g) Off-load the two DSC Loads then drive Trucks 3 and 4 with trailers to the dropping-off area.
(h) Maneuver Trucks I and2 into the positions shown and off-load their pallets by raising the dump bodies .
(i) Drive Truck 3 back onto site and position it as shown 18ft (5.5m) from marker, and off-load its pallet.
(j) Drive Truck 4 onto site positioned bottom end of center line at the rear of the construction site, complete with its LR/D Load to be used as the booming vehicle when requested by the Bridge Commander.

d. Off-loading on Restricted Sites

The procedures below should always be followed when off-loading on restricted sites.

(1) Ensure that the pallets are dropped so that they are never closer than 1 Oft (3.0 m) from the centerline.

(2) Pallets should be off-loaded in the order in which they are needed for construction. For example, the pallet containing the erection and launch components is always off-loaded first, to one side of centerline, near the edge of the gap.

(3) Use the dump trucks, or other unit vehicles, as anchorages for off-loading trailers.

(4) Movement and positioning of vehicles onto restricted sites is dependent on site conditions.

(5) Disconnect trailers in an area clear of the site and have trucks return for off-loading.

(6) Always unload all erection and launch components and at least 2 bay loads before starting construction.

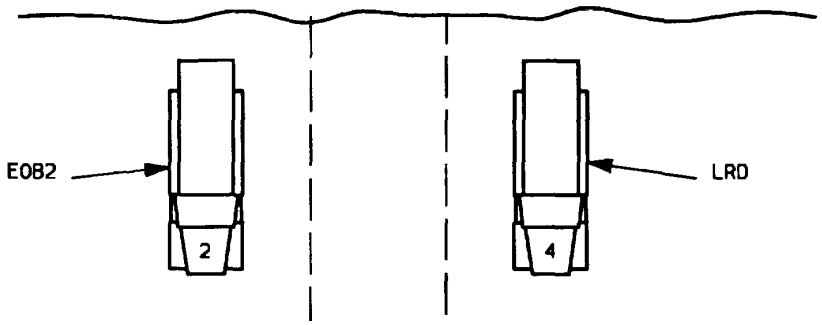
CAUTION
Do not use the bridge as an anchorage to off-load ramp and deck loads. Use caution when reversing vehicles on site.

EXAMPLE

The following gives an example of off-loading a 2E + 12 bay on a restricted site.

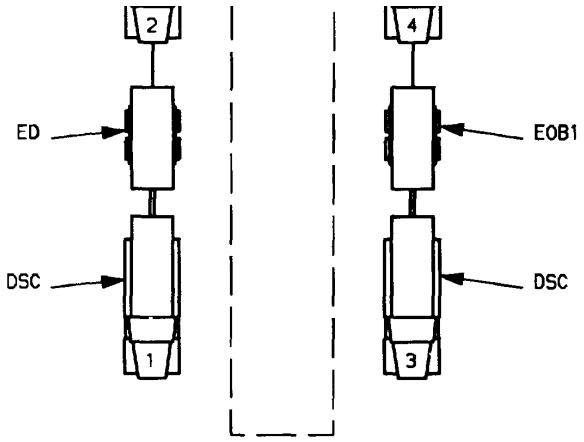
TRUCK #	***Load***	***Trailer #***	***Load***
1	*DSC*	*1*	*ED*
2	*EOB*	*2*	*DSC*
3	*DSC*	*3*	*EOB1*
4	*LR/D*	*4*	*DSC*

(a) Uncouple Trailer 2 and 4 at trailer dropping off area, then drive Trucks 2 and 4 onto site and reverse into positions shown



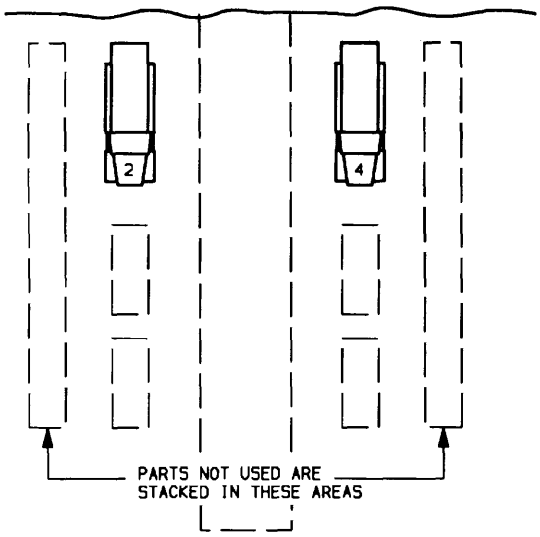
(b) Drive Trucks 1 and 3 with trailers onto site and reverse into positions shown. Unload ED and EOB one loads using Trucks 2 and 4 as anchor points.

(c) Drive Trucks 1 and 3 off site and unload trailers at the trailer dropping off area.

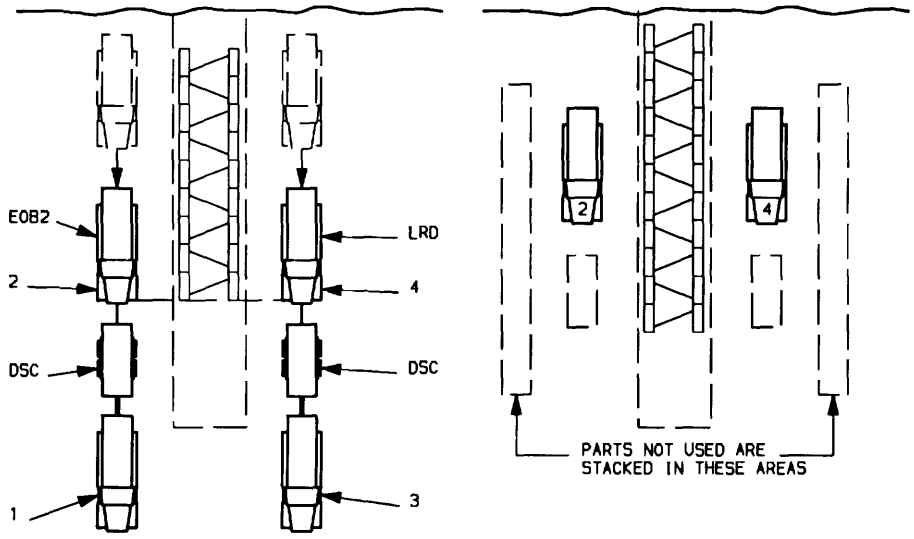


(d) Drive Trucks 1 and 3 back on site and off-load their pallets - DSC, then drive off site and pick up Trailers 2 and 4.

(e) Unload pallets on ground and use components to construct 6 bays of bridge. Place all components not required at this time to sides as shown, and carry all empty pallets off site.

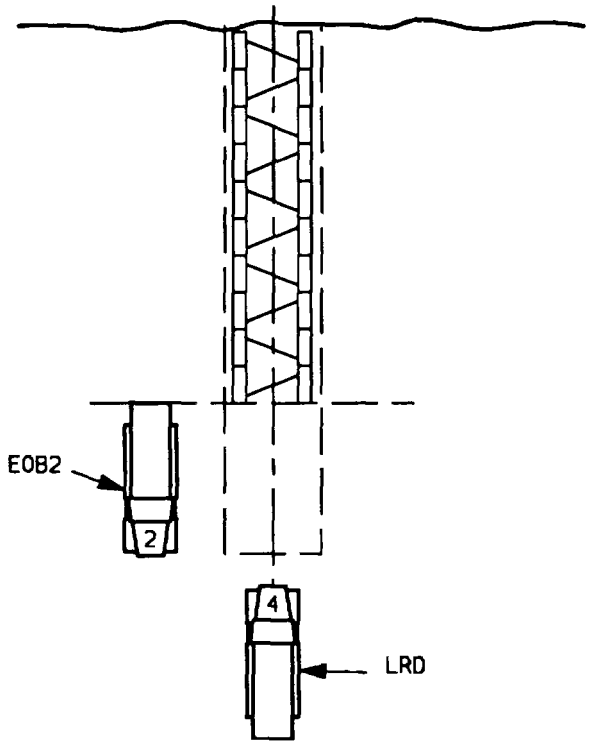


(f) Move Trucks 2 and 4 toward uncompleted end of bridge and stop when in line with bridge. Then drive Trucks 1 and 3 with DSC Trailers onto site and reverse up to trucks 2 and 4. Off-load the pallets, then drive off site.



(g) Unload pallets on ground and use components to construct 6 bays of bridge. Place all components not required at this time to sides of site as shown, and carry all empty pallets off site.

(h) Drive Truck 2 toward uncompleted end of bridge and stop when rear of truck lines up with bridge end. Off-load pallet from truck, then drive truck off site.



(i) Drive Truck 4 complete with load onto centerline ready to be used as booming vehicle when requested by the Bridge Commander.

CHAPTER 4

GENERAL DRILLS

Page

4-1. INTRODUCTION 4-2
4-2. PANEL POINT CODE AND CENTER OF GRAVITY 4-2
4-3. LAUNCHING NOSE CODE 4-3
4-4. LANDING ZONE NUMBER 4-4
4-5. ROLLER BEAMS 4-4
4-6. CONNECTING TOP PANELS 4-16
4-7. CONNECTING BOTTOM PANELS 4-18
4-8. ASSEMBLE FRONT END OF BRIDGE AND FIRST BAY (DOUBLE STORY) 4-20
4-9. ASSEMBLE REAR END OF BRIDGE 4-25
4-10. CONNECTING LAUNCHING NOSE ROLLER 4-33
4-11. CONNECTING/DISCONNECTING LAUNCHING NOSE CROSS GIRDER & POSTS 4-33
4-12. ASSEMBLING LAUNCHING NOSES FOR LAUNCH 4-36
4-13. STRIPPING LAUNCHING NOSES DURING LAUNCH 4-45
4-14. ASSEMBLING LAUNCHING NOSES FOR DE-LAUNCH 4-47
4-15. LANDING ROLLER PEDESTAL 4-49
4-16. FITTING LINK COMPONENTS 4-52
4-17. OPERATION OF PULLER 4-63
4-18. LAUNCHING BY VEHICLE 4-65
4-19. BOOMING/LAUNCHING THE BRIDGE 4-68
4-20. JACKING 4-71
4-21. DAVITS 4-82
4-22. CRANE 4-87
4-23. PACKING ENDS OF BRIDGE 4-88
4-24. LAYING RAMPS 4-90
4-25. LAYING DECKS 4-91
4-26. FITTING CURBS AND GUIDE MARKERS 4-92
4-27. STRIPPING ON ORIGINAL FAR BANK 4-93

4-1. INTRODUCTION

This chapter describes the general drills used during assembly/disassembly of SS, DS and LR MGB.

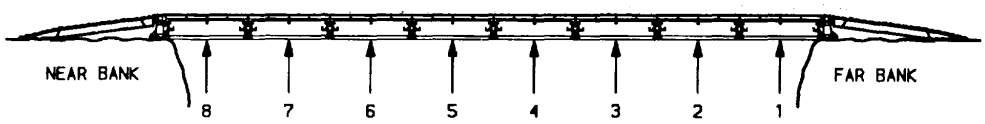
These drills are used repetitively so it is important that the operator becomes familiar with them before attempting to carry out the step by step procedures described in Chapters 5, 6 and 7. Most of the drills describe the assembly or connection of components; unless otherwise stated, the disassembly or disconnection drill is the reverse procedure.

4-2. PANEL POINT CODE AND CENTER OF GRAVITY

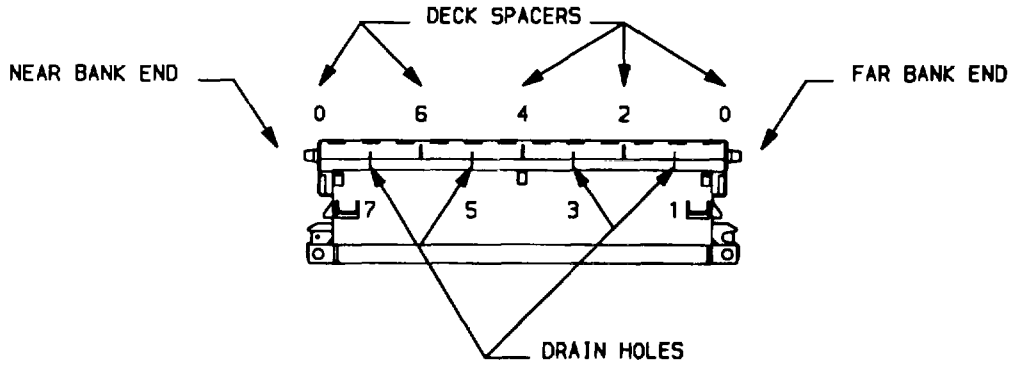
a. Single Story

The panel point code is a system of numbering used to identify the location of the center of gravity (C of G) and the boom and launch points of the bridge. The numbering is based on the top panels, their deck spacers and drain holes. The top panel numbering starts at the top panel next to the far bankseat beam. The panel point numbering begins at the front of the top panel i.e. the end closest to the far bank. One panel point (1 pp) means 1/8 of a bay = 9 in (229 mm).

(1) Top panel. The top panels in the bays of the bridge are numbered 1, 2, 3, 4, 5, etc.



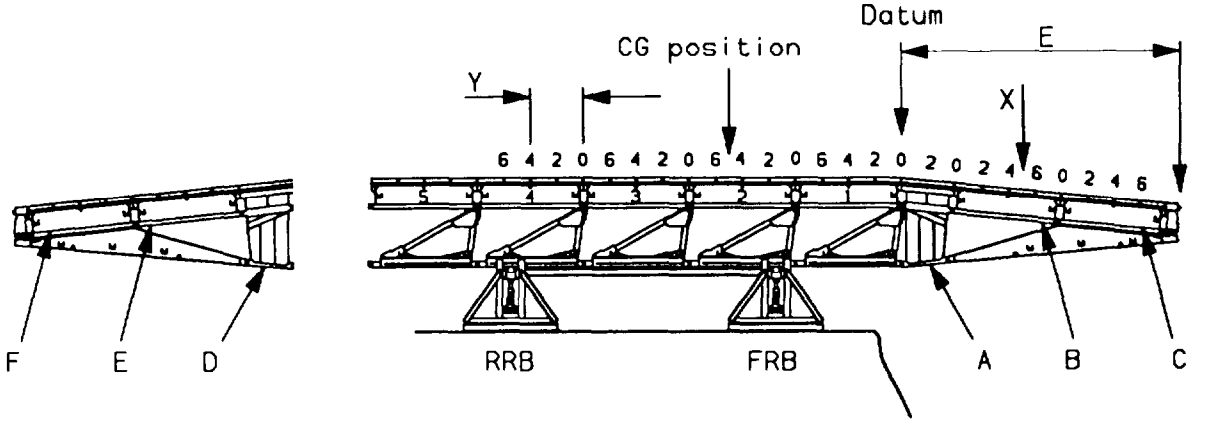
(2) Top panel deck spacers. The deck spacers are panel points 2, 4 and 6. The deck spacer at the rear of the top panel becomes panel point 0 of the next panel or bay.



(3) Drain holes. The drain holes halfway between each deck spacer, are panel points 1, 3, 5 and 7.

b. Double Story and Link Reinforced

The code system for double story and link reinforced bridges is the same as described in paragraph 4-2 a., but the junction and top panels at the ends of the bridge are lettered A, B and C (far bank end of bridge) and D, E and F (near bank end of bridge). The panel points run down the junction panel to the bankseat beam.



CG is at 2p5
Bridge boomed to 4p5
Distance Y = 4pp

X is described as Bp5
Junction between A and B is Bp0
E = End of bridge

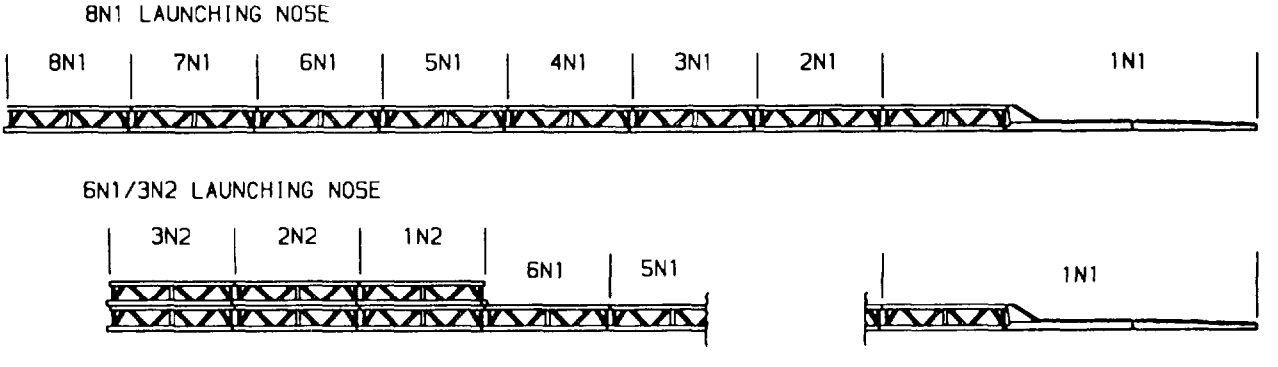
c. Boom and Center of Gravity Marker.

Two carrying bars may be used by the NCOIC to act as a boom marker and center of gravity marker. The bars are hung on the outside of the bridge in the top panel deck rail. The boom marker carrying bar should be painted orange, and will mark the position of the next booming or launching point. The center of gravity markercarrying bar should be painted blue, and will mark the center of gravity of the bridge during construction. As construction continues, the center of gravity of the bridge will change, so before booming or launching, the center of gravity marker must agree with the actual stage of construction reached.

4-3 LAUNCHING NOSE CODE

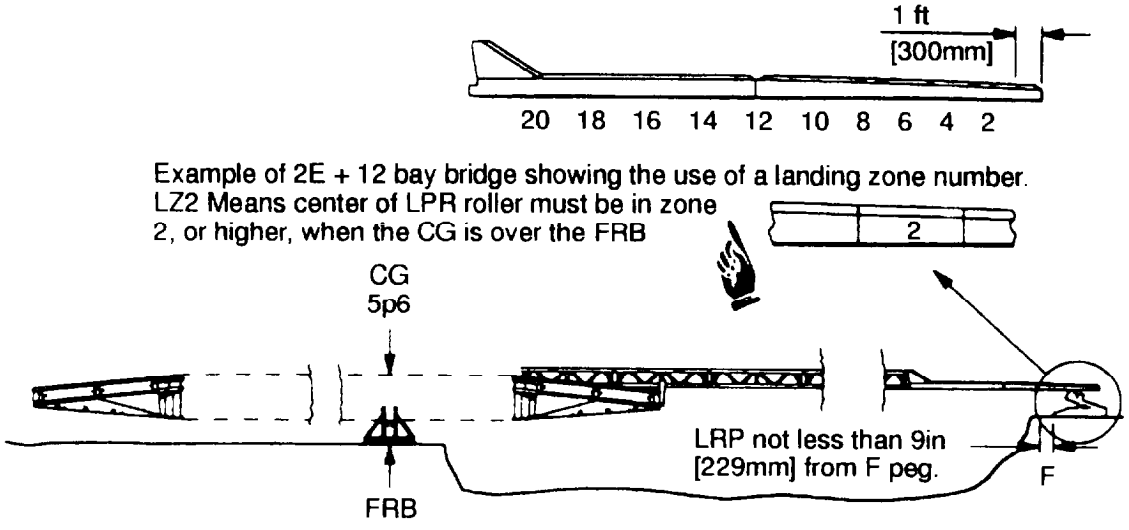
The launching nose is coded in the build procedures and building tables as follows:

The light launching nose front, light launching nose rear, and first launching nose heavy (total length 30 ft) are coded 1N1 The second launching nose heavy (1 Oft) is coded 2N1, the third 3N1 and so on.
When the nose configuration changes to two tier (double story), the first double story is coded 1N2, the second 2N2 and the third 3N2.



4-4 LANDING ZONE NUMBER

The building tables and build procedures include a landing zone number to ensure correct location of the landing roller pedestal under the launching nose. The light launching nose is considered **as** divided into twenty equal zones, each 1 ft (300 mm) in length. During building or delaunching, the landing roller pedestal must be positioned not less than 9 in (229 mm) from the F peg, and at this time the LZ number is checked for correct position over the landing roller pedestal roller. The landing zone number should be that given or HIGHER. Never less than that given.


1 ft
[300mm]
20 18 16 14 12 10 8 6 4 2
Example of 2E + 12 bay bridge showing the use of a landing zone number.
LZ2 Means center of LPR roller must be in zone
2, or higher, when the CG is over the FRB
2
CG
5p6
LRP not less than 9in
[229mm] from F peg.
F
FRB

4-5 ROLLER BEAMS

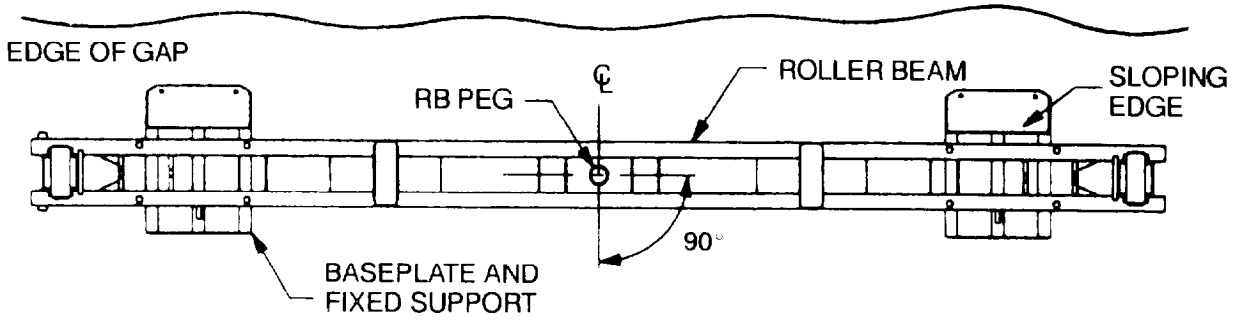
In the assembly/disassembly procedures described in Chapters 5, 6, and 7 the term “roller beam” is defined as follows:

Single Story bridges the roller beam comprises - roller beam, baseplates and fixed supports.

Double Story and Link Reinforced bridges the front or rear roller beam comprises - roller beam, crossgirder, baseplates and adjustable supports. A capsill roller beam comprises - rocking rollers, capsill beam, cross girder, baseplates and adjustable supports.

a. Single Story

Single story bridges are launched on one roller beam, with building pedestals to support the bridge during assembly. The drill to set up the roller beam is as follows:



(1) Position the roller beam so that it is approximately centered over the RB peg and at 90° to the bridge centerline [℄].

(2) Place roller beam fixed supports in the baseplates.

(3) Position baseplates under roller beam.

(a) Ensure that roller beam is located in pivoting head of fixed support.

(b) Ensure that sloping edge of baseplate faces gap.

(c) Packing (3 in x 8 in x 36 in) can be used under baseplates if bank conditions are bad.

(4) Final position roller beam.

(a) Ensure roller beam is centered over centerline and RB peg.

(b) Ensure roller beam is at 900 to centerline.

(5) Lock rollers.

b. Double Story 2E + 1 thru 2E + 12 bay

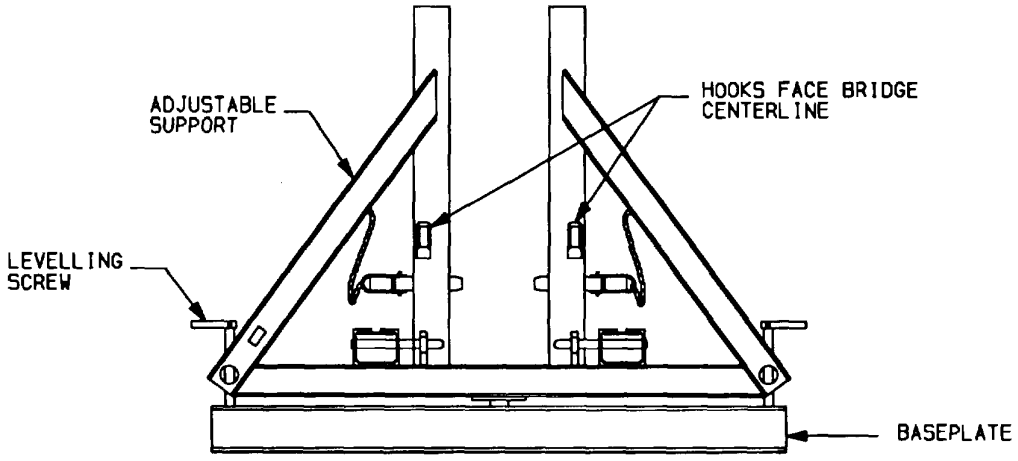
Double story bridges (2E + 1 thru 2E + 12 bay) are assembled/launched using a building frame which consists of two roller beams and a longitudinal girder. The drill to assemble the building frame is as follows:

(1) Put two double story baseplates either side of the FRB peg approximately 15 ft (4.6 m) apart.

(2) Position and hold a roller beam adjustable support on each front roller beam baseplate.

(a) Ensure that hooks on supports face centerline.

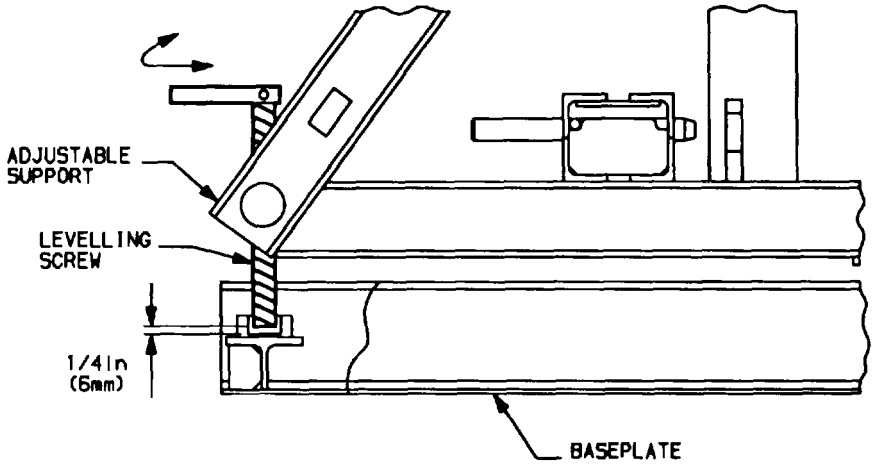
(b) Seat levelling screws in holes of baseplates.



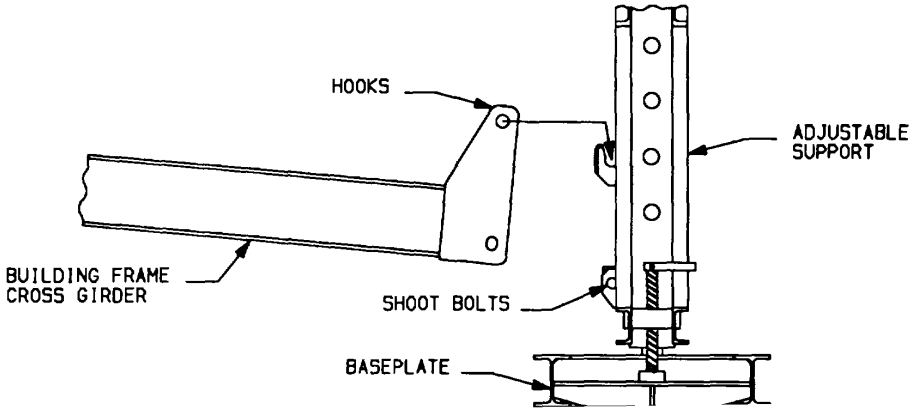
CAUTION

Damage to equipment will occur If the levelling screws are not adjusted to allow 1/4 in (6 mm) gap.

(c) Turn the adjustable support levelling screws into the baseplate sockets so that adjustable support is vertical. Allow 1/4 in (6 mm) space between screw and socket so that the support may rock back and forth on the pivot (front to rear).



(3) Hook a building frame cross girder onto the adjustable supports. One of the supports may have to be moved slightly so both ends of the cross girder can be attached.



(4) Push shoot bolts through each cross girder and support brackets and turn to lock position.

WARNING

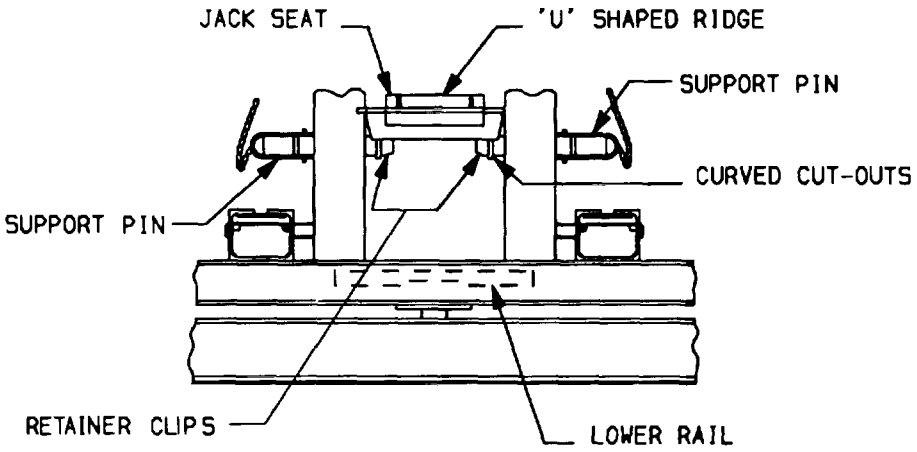
If roller beam Is to be set higher than the lowest setting, push captive support pin through each adjustable support post at proper height. If support pins are used, ensure that they are fully seated (pushed In) and that the jack seat is fully seated on each pin.

(5) Place a jack seat over support pins or lower rail in each adjustable support.

(a) Curved cut-outs fit over pins or rail in bottom of support.

(b) Open end of U-shaped ridge faces away from centerline.

(c) Insert retainer clip through support pin.

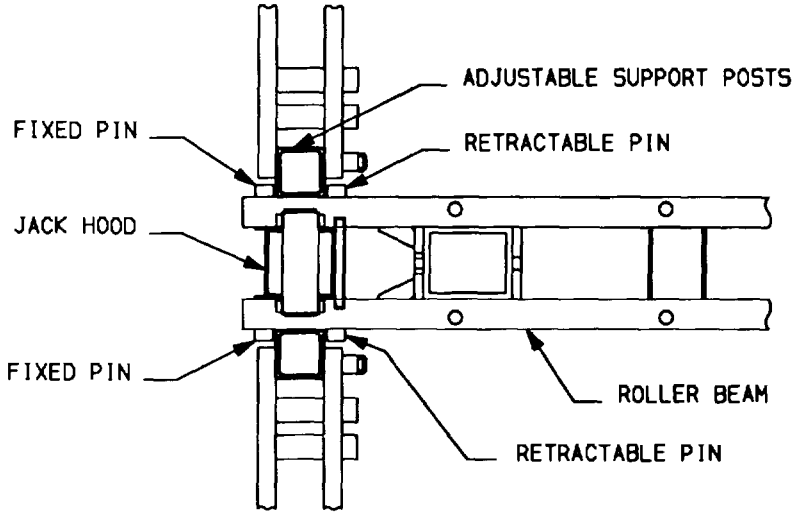


(6) Place a roller beam into adjustable supports.

(a) If site conditions permit, roller beam can be slid into supports from the side. Ensure that retractable pins are pushed in, to clear supports.

(b) If site conditions do not permit sliding the roller beam from the side, it will be put into adjustable supports by lifting the roller beam above the tops of the posts, then lowering it until beam sets at bottom of posts.

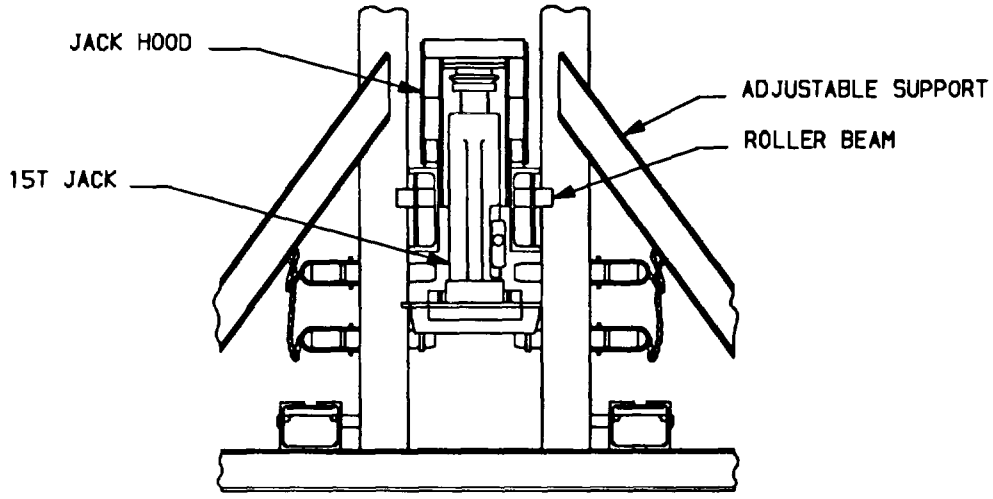
(c) In either case, ensure that retractable pins are pushed out to lock the roller beam into supports once the fixed pins are butted against the adjustable support posts.



(7) Raise jack hood on each end of roller beam and place a hydraulic jack (15 ton) on each jack seat.

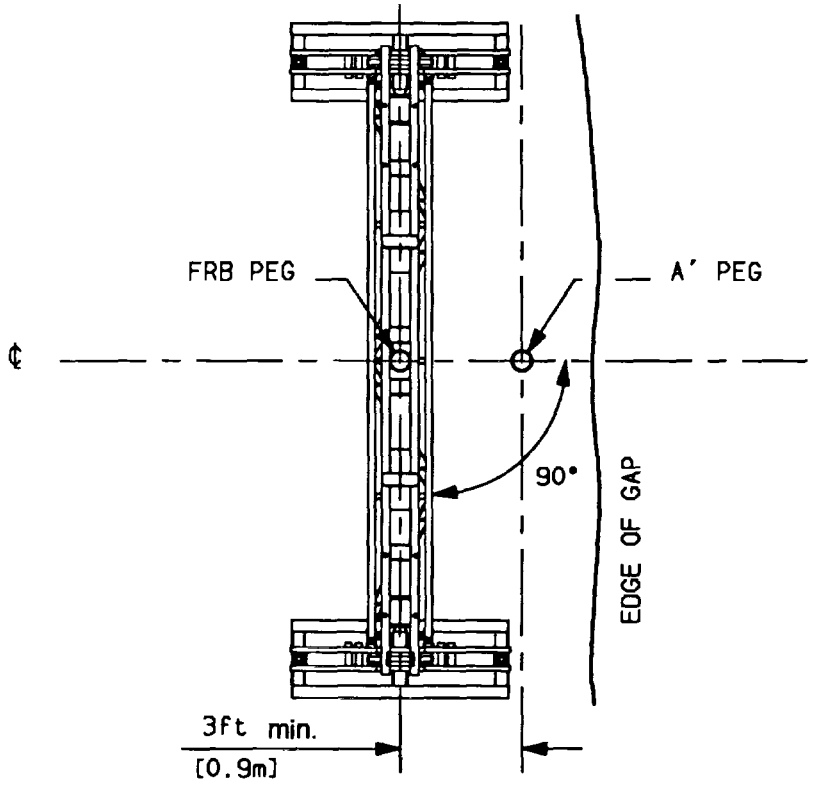
(a) Operate hydraulic jack to raise roller beam 1/2 in (13 mm).

(b) Do not remove support pins.



(8) Repeat (2) to (7) to build the second roller beam (rear roller beam).

(9) Position the center of front roller beam over centerline of bridge. Pull on baseplates until center of front roller beam is directly over FRB peg. Ensure that roller beam is at right angle (900) to centerline of bridge.

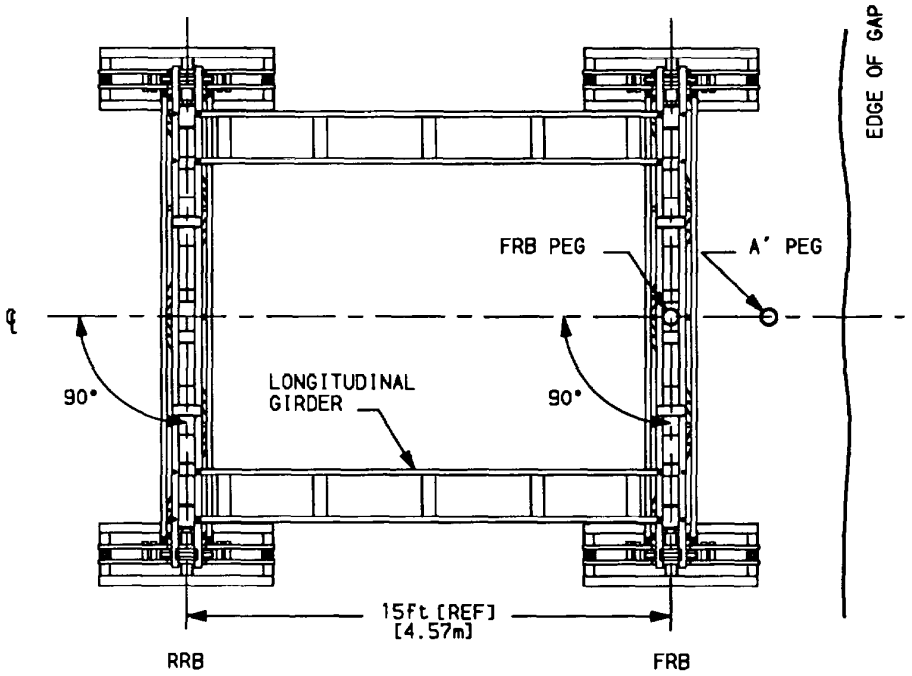


CAUTION

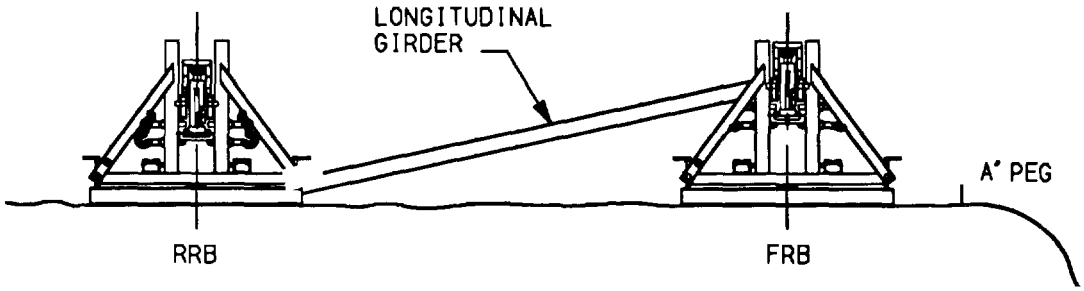
It Is very Important that front roller beam be correctly positioned at this time. If It Is not, serious problems will arise later during construction. These problems range from skewing of the bridge off of the centerline to possible damaging of the bridge and roller beams.

(10) Connect two longitudinal girders to the front roller beam by locating the dowels in the holes in the roller beam. Position the RRB roughly at the other end of the longitudinal girders.

(11) Repeat step (10) with the rear roller beam, pulling on baseplates to locate the dowels in the holes. When the longitudinal girders are located in both roller beams this will final position the roller beams at 900 to the centerline and centered over centerline. Do not move front roller beam during this operation as it was final positioned at step (8).



(12) After a final check to ensure that both roller beams are correctly positioned, disconnect the longitudinal girders from both roller beams, lower the girder at the rear roller beam and place on the ground, then re-locate the girder in the front roller beam. The girders will remain in this position to assist in the assembly of the end of bridge (para. 4-8).



(13) Adjust roller beams so that front roller beam is higher than the rear roller beam. Level both roller 4-9 beams (para. 4-5d.) and lock rollers (para. 4-5e.).

c. Double Story Using Capsill Roller Beam

Double story bridges 2E + 13 thru 2E + 22 bay with and without link reinforcement use a building frame as described in paragraph 4-5 b., with an additional capsill roller beam, which has rocking rollers to carry the extra weight. For link reinforced bridges the capsill roller beam is positioned 9 ft (2.7 m) from the A' peg to provide enough working area to attach link components. For bridges over 12 bays without reinforcement the capsill roller beam is positioned 3 ft (0.9 m) minimum from the A' peg. The drill is as follows:

(1) Place two double story baseplates either side of the CRB peg approximately 15 ft (4.6 m) apart. These baseplates will be for the capsill roller beam.

(2) Put a roller beam adjustable support in each baseplate and hook a building frame cross girder to the adjustable supports [para. 4-5 b. steps (2) thru. (4)].

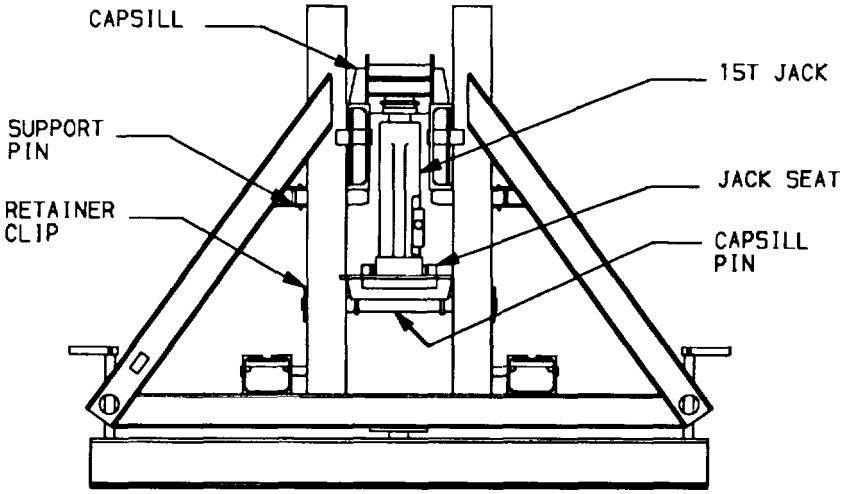
(3) Place a capsill pin in the correct hole of each adjustable support (this hole position is determined by design) and secure with retainer clips. Place a jack seat over the capsill pin.

(a) Curved cut-outs fit over capsill pin and open end of U-shaped ridge faces away from bridge centerline.

(b) Capsill pin is never used in holes 4, 5 or 6.

(4) Place a support pin in each post of the adjustable support. The support pin must be placed one hole above the capsill pin, to permit easy installation of hydraulic jack.

(5) Place a capsill roller beam onto the support pins. The capsill must be put in through the top of the adjustable support posts. Fixed pins prevent sliding the capsill in from the side.



(6) Place a hydraulic jack (15 ton) on each jack seat.

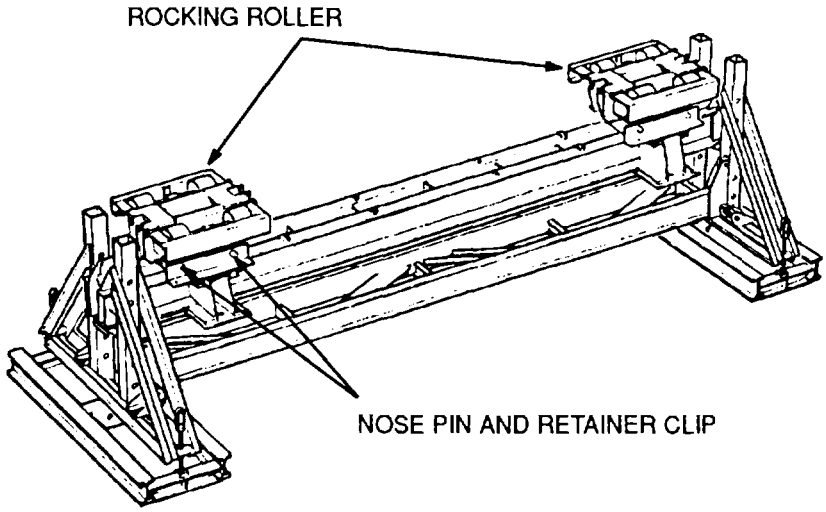
(a) Operate hydraulic jack to raise capsill off support pins. -

(b) Do not remove support pins.

(7) Place a rocking roller at each end of the capsill.

(a) Secure rocking roller to capsill with two nose pins.

(b) Insert retainer clips through the end of each nose pin.



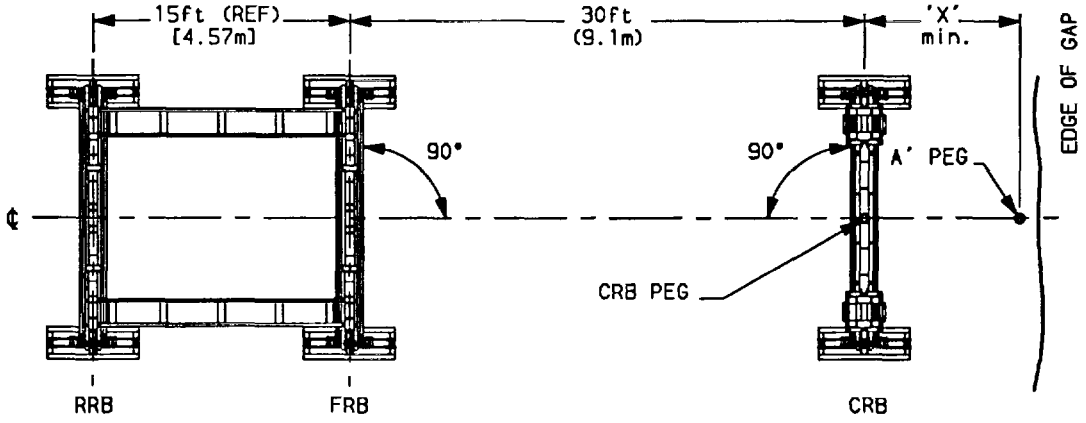
NOTE
This assembly Is now called the capsill roller beam (CRB).

(8) Position capsill roller beam. Ensure that the center of capsill roller beam is over centerline of bridge. If it is not, pull on baseplates until center of capsill roller beam is directly over capsill roller beam peg. Ensure that capsill roller beam is at right angle (900) to centerline of bridge.

(9) Assemble the front roller beam and rear roller beam (para. 4-5b.) and position these on site as shown. Ensure both roller beams are centered over bridge centerline and at 900 to bridge centerline.

(10) Lower longitudinal girder at RRB [para. 4-5 b. step (12)].

(11) Set roller beams at required heights, level all roller beams (para. 4-5d.) and lock rollers (para. 4-5e.).



'X' (min.)	BRIDGE
9 ft (2.7m)	13-22 BAY LINK REINFORCED.
3 FT (0.9m)	13-22 BAY W/O REINFORCEMENT.

CAUTION

It is very Important that all of the roller beams be correctly positioned at this time. If they are not, serious problems will arise later during construction. These problems range from skewing of the bridge off of the centerline to possible damaging of the bridge and roller beams.

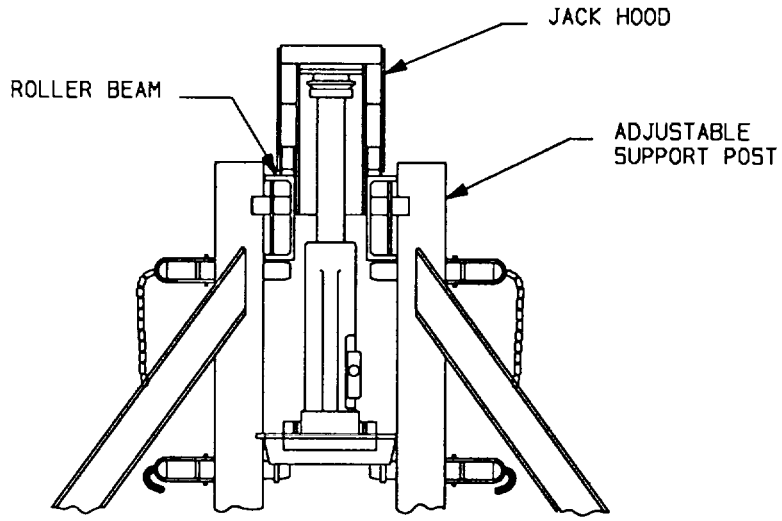
d. Leveling and Re-staging Roller Beams

It is very important at all times to keep the roller beams level (laterally). Failure to do so will result in difficulty in connecting/disconnecting components. It is also necessary to ensure that roller beams are adjusted to achieve an acceptable working height. The NCOIC must monitor the height and level of roller beams continually throughout the operation.

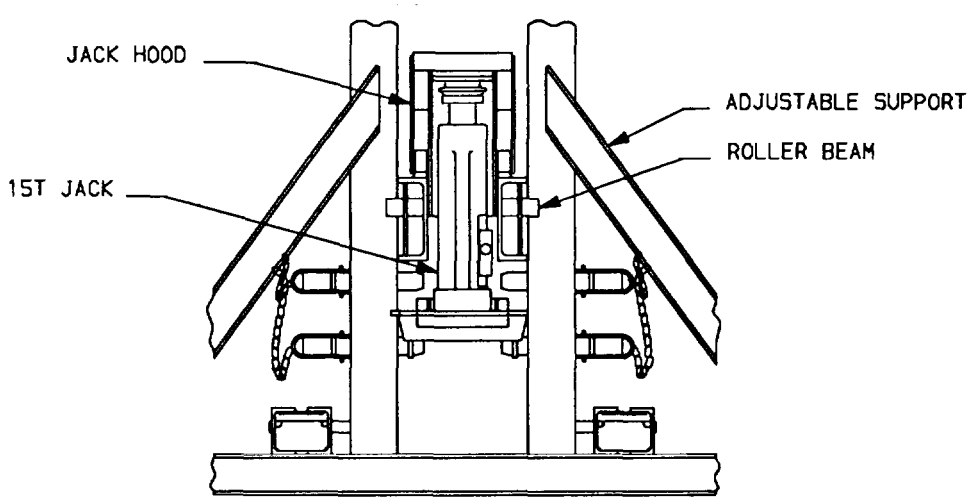
Level the roller beams using a carpenters level placed in the center of the roller beam and adjust by raising or lowering the jacks. To maintain an acceptable working height it may be necessary to re-stage the roller beams.

WARNING

When re-staging roller beams (including capsill roller beam) never allow the roller beam to go beyond the top of the adjustable support posts.



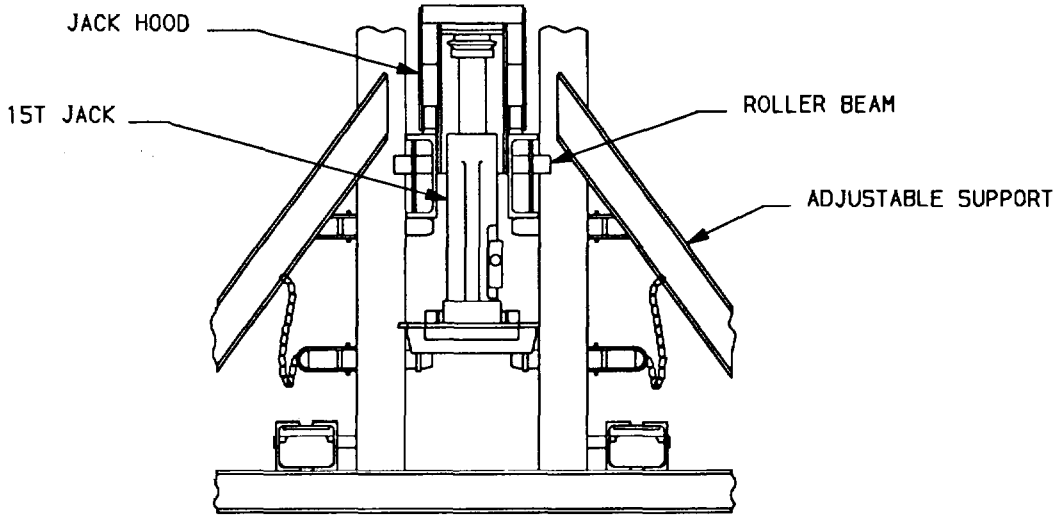
The following procedure describes re-staging a roller beam upwards. To re-stage downwards the procedure is reversed. The procedure is the same for a capsill roller beam except the jackseat sits on a capsill pin, not support pins. This procedure starts with the roller beam supported by the jacks.



(1) Raise the jack until the roller beam has just passed a hole in the adjustable support posts.

(2) Put support pins in this hole and insert retainer clips.

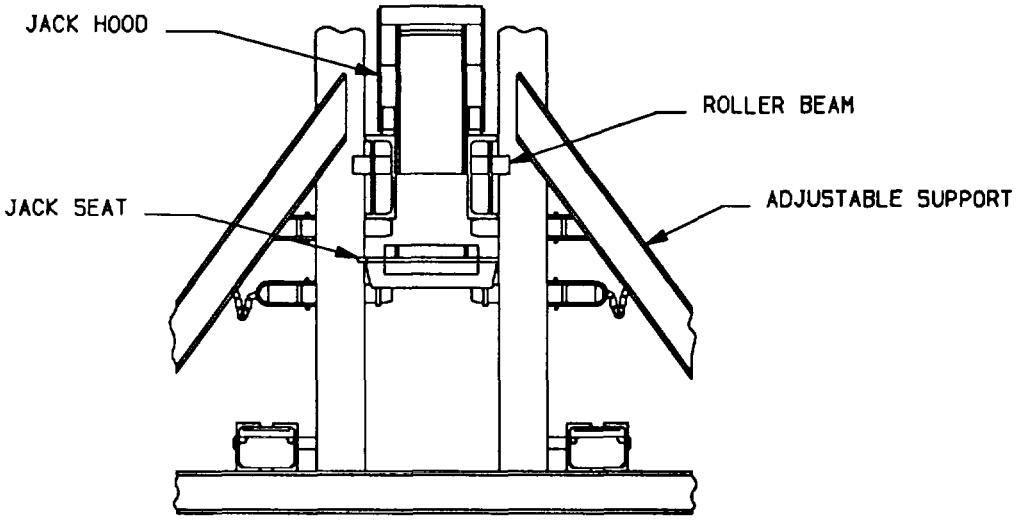
(3) Lower the jacks until the roller beam is on the support pins.



(4) Lower the jack completely and remove it from the jack seat.

(5) Remove the jack seat and reposition the jack seat support pins (or capsill pin) into the next higher hole.

(6) Place the jack seat on the support pins.



(7) Insert the jack and raise the jack until the roller beam reaches the required height.

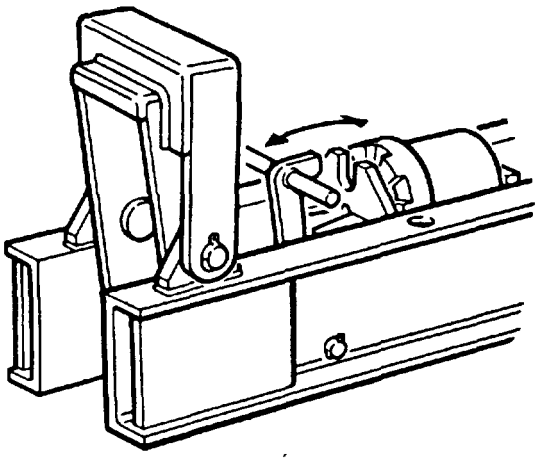
(8) Leave the support pins in position as a safety precaution.

e. Locking Roller Beams

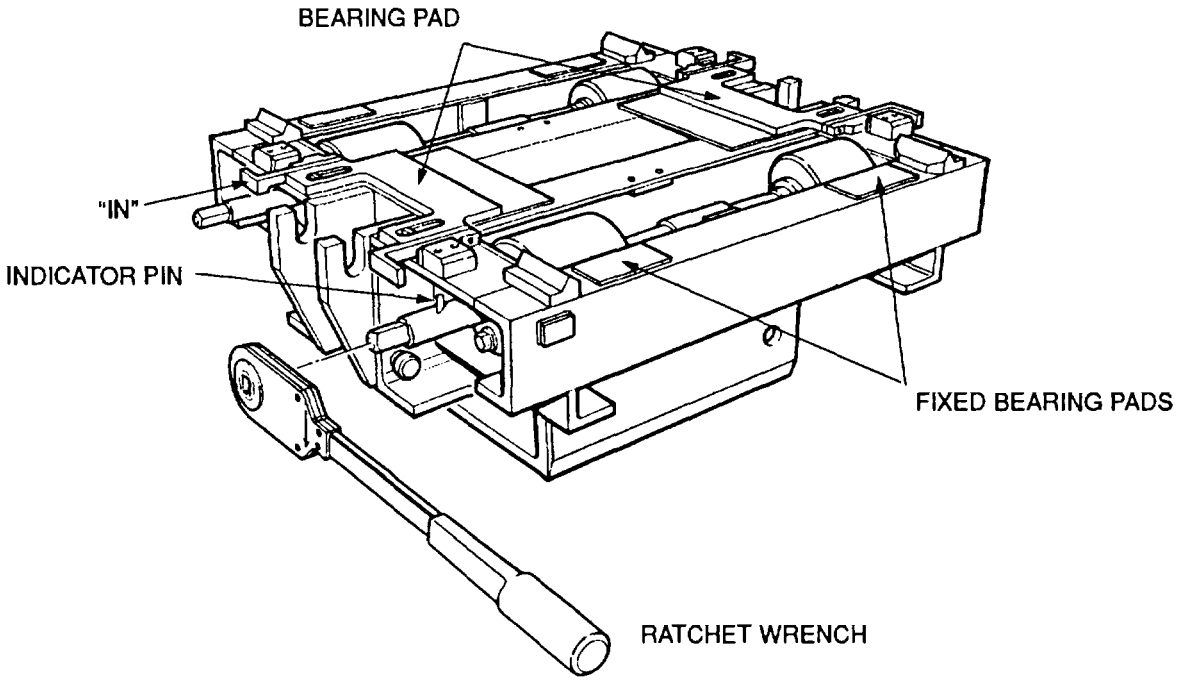
WARNING

Do not use locks In rollers as a brake during booming. Wait until the bridge has stopped moving before Inserting lock catches or bearing pads.

The front and rear roller beams are locked by engaging the roller catch in the slotted outer rollers.



The capsill roller beam is locked by pushing the bearing pads to the "IN" position, then lowering the rollers using the ratchet wrench. This allows the bridge to sit on the bearing pads. Indicator pins on the end of the shafts show whether the rollers are in the "UP" or "DOWN" position.



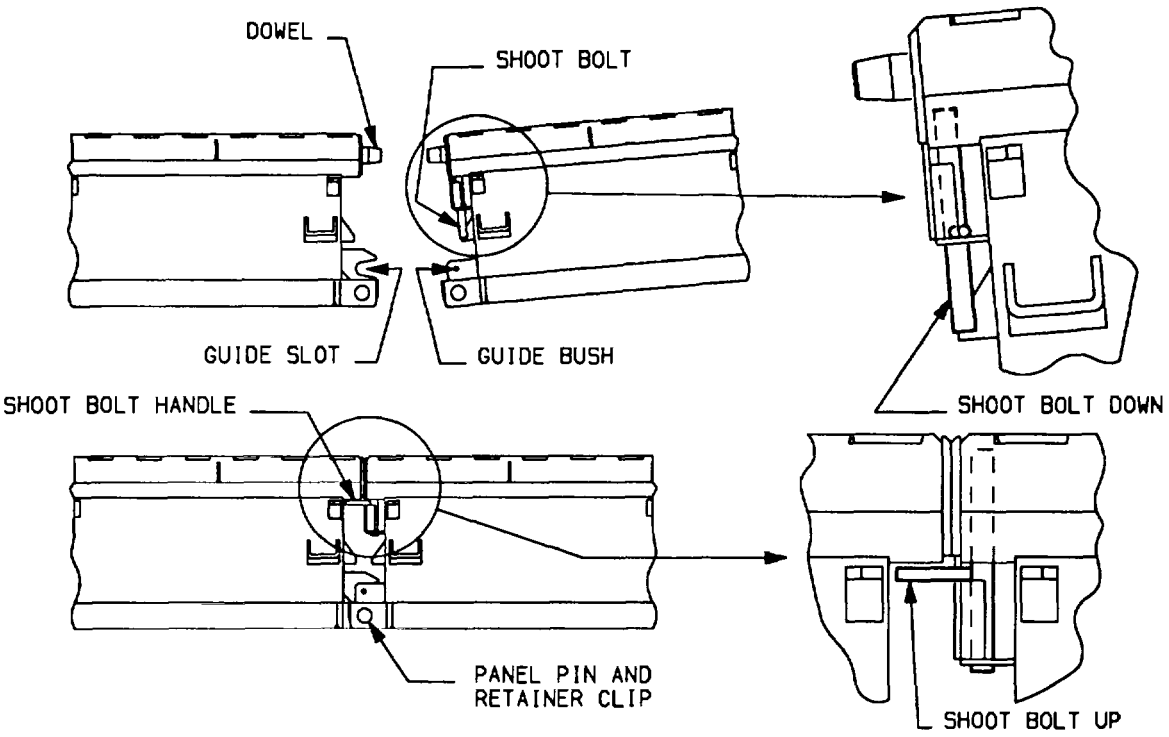
It may be necessary to move the bridge backwards or forwards slightly to engage the roller catches or bearing pads. During booming, when the capsill roller beam is used, the capsill rollers are locked AFTER the front and rear roller beams have been locked.

4-6. CONNECTING TOP PANELS

a. Top Panel to Top Panel or Bankseat Beam

The procedure for connecting top panel to top panel is shown. The procedure for connecting top panel to bankseat beam is the same.

This drill is performed by the four personnel carrying the top panel.



(1) Engage the dowels and sockets of both top panels.

(2) When the compression faces contact each other, lift the shootbolt and turn it to the left to lock the shootbolt. Do not hammer or force the shootbolt. Do not push upwards on the end of the handle as this tilts the bolt and makes closing less easy. Apply upward lift along full length of handle.

(3) Let the rear of the top panel down. The resilient mount in the guide slot will line up the pin holes in the jaws.

(4) Slide in panel pin until the shoulder butts against the jaws.

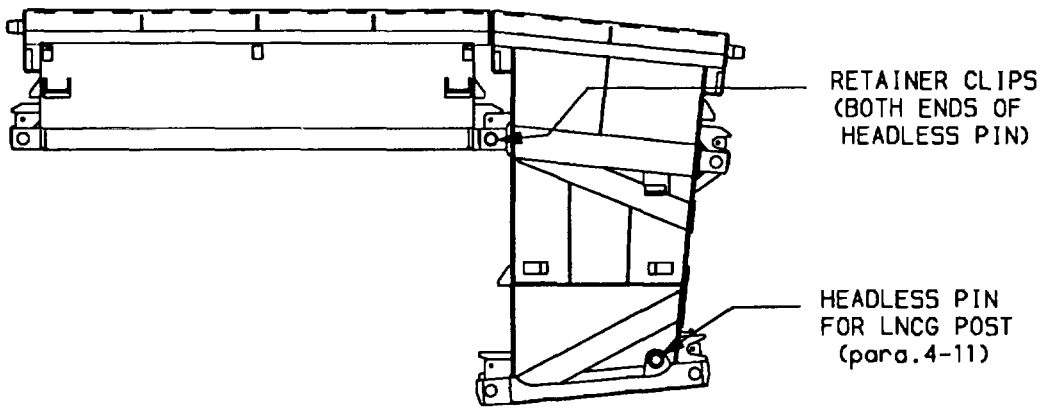
(5) Put a retainer clip through the end of the pin.

b. Top Panel to Top Panel - Double Story

The drill to connect top panel to top panel on double story bridges is the same as single story bridges (para. 4-6 a.) except an extra person is required to lock one shootbolt, and to insert the panel pin. This is necessary because of the extra height involved.

An alternative procedure is to use the panel erection aid (para. 4-6 d.).

c. Top Panel to Junction Panel



The drill to connect top panel to junction panel is the same as connecting top panel to top panel on double story bridges (para. 4-6 b.) except a headless pin is used. The headless pin should be inserted until an equal amount of pin is showing on both sides of top panel. This is one of two places the headless pin is used. The other headless pin is used to connect the LNCG post at the far bank end of bridge.

NOTE

Do not put retainer clips In the headless pin until bottom panel Is joined to the top and junction panels (para. 4-7b.).

The headless pin is used if there is any chance the bridge will be delaunched and disassembled on the far bank. Good practice is to always use a headless pin in this position.

d. Use of Panel Erection Aid

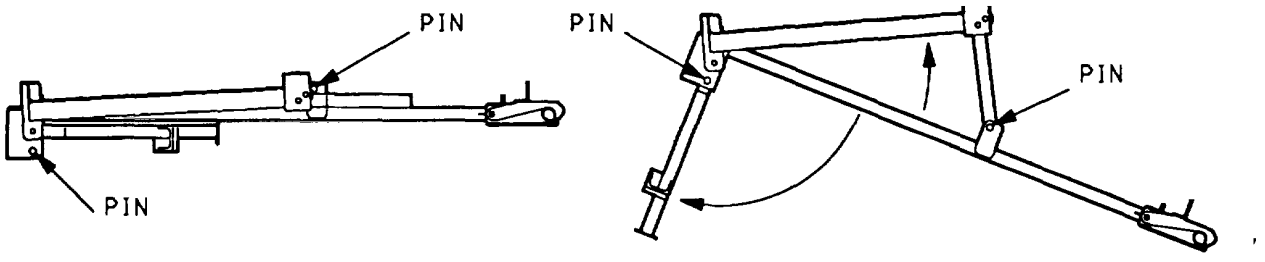
The panel erection aid is used to lift top panels into position if the lift is very high or difficult. The panel erection aid can be used to connect top panel to top panel or top panel to junction panel. Panels can be fitted quicker without the aid but the work is more tiring. To use the panel erection aid:

(1) Remove the pins holding legs in transit position

(2) Unfold legs and lock in position with pins. Secure with retainer clips.

TRANSIT POSITION

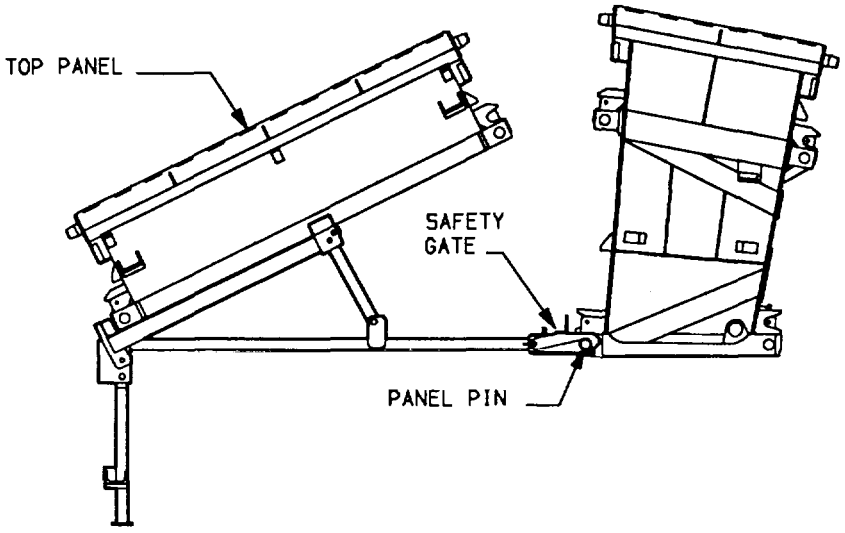
UNFOLDED



(3) Insert a panel pin in bottom panel jaws or lower jaws of junction panel. Shoulder of pin must be kept 1.75 in (45 mm) from outer jaw.

(4) Engage the jaws of the erection aid to the panel pin, ensuring that the safety gate is locked. The other end of aid rests on ground.

(5) Lift and place the front end of the top panel on the front cross bar of the erection aid, then slide the panel forward until its rear jaws are seated at the back of the aid.



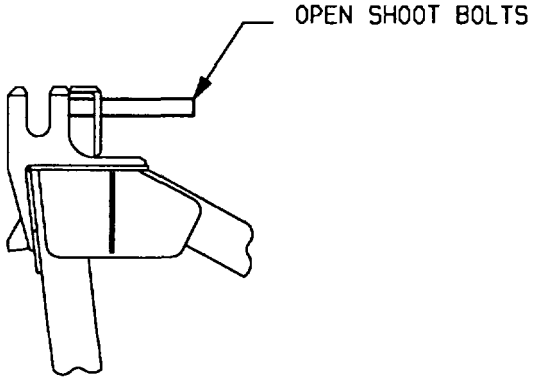
(6) Lift the rear of the erection aid using two carrying bars in brackets on each side of leg. A third carrying bar bracket is available if needed. Lift until panel engages the junction panel and the shootbolts can be engaged.

(7) Disengage the erection aid by either, raising the safety gate and removing the aid, or supporting the front of the aid and withdrawing the panel pin.

4-7. CONNECTING BOTTOM PANELS

a. Bottom Panel to Top and Bottom Panels

(1) Open the shootbolts in the top jaws of the bottom panel. This should be done before carrying the bottom panel to the bridge, either while still on the pallet or on the ground beside the pallet.

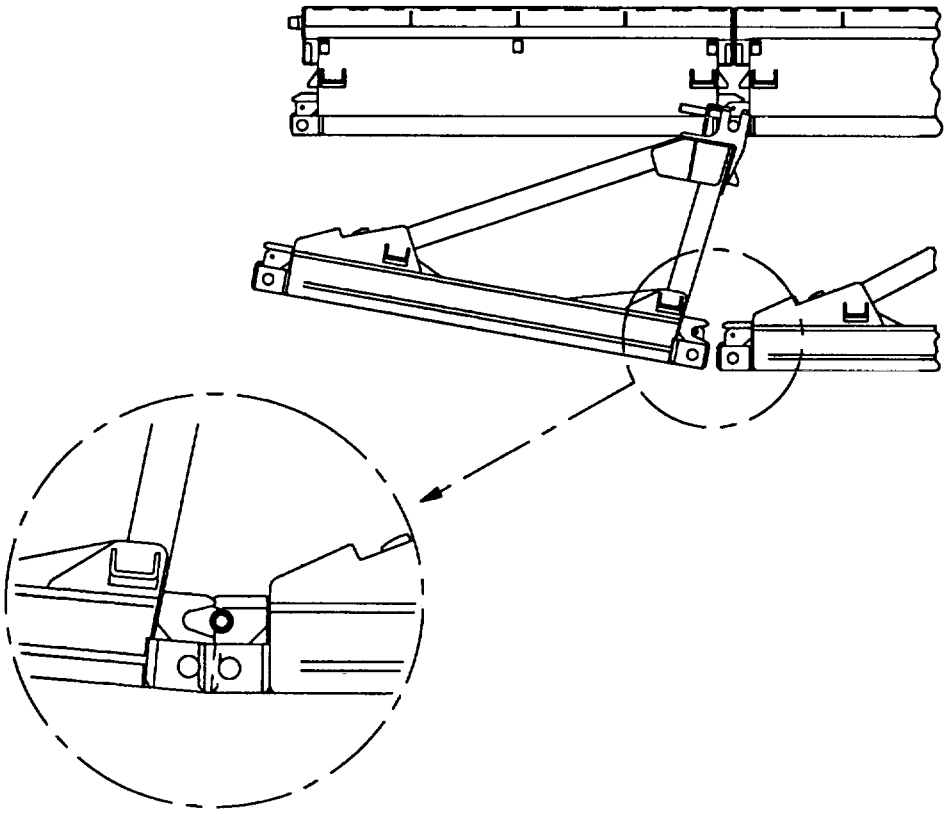


(2) Carry the bottom panel into place by walking directly behind the top panel.

(3) Lift rear end of bottom panel so that it is slightly higher than the front.

(4) Guide the top jaws around the ends of the panel pin connecting the top panels.

(5) Lower rear end of bottom panel.



(6) Close and lock the shootbolts.

(7) Bear down on rear end and at the same time lift and push forward at the front so that the resilient mount and guide slot line up the pin holes in the bottom panel jaws.

(8) Slide in panel pin until shoulder butts against the jaws.

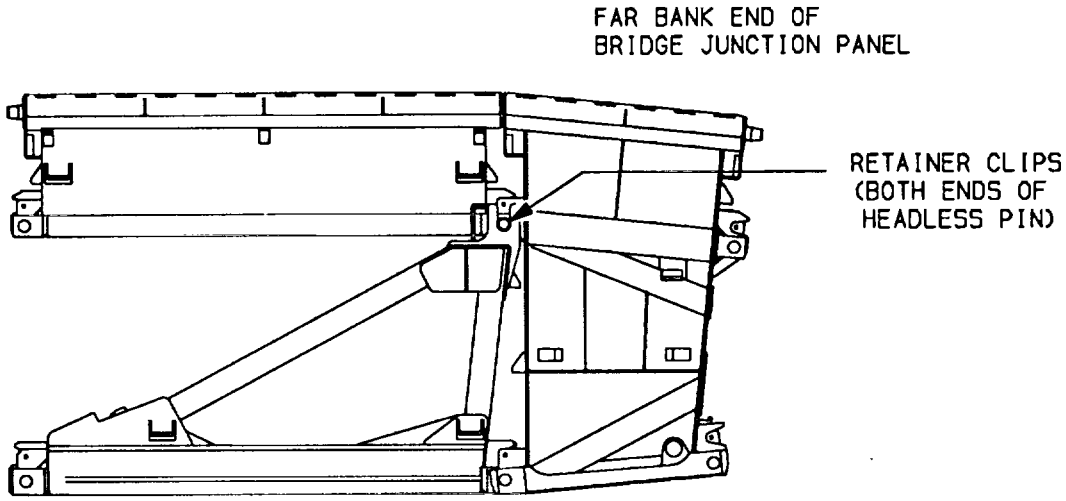
CAUTION

Ensure that retainer clip In bottom panel Is In the horizontal position to prevent it from damaging rocking rollers.

(9) Put retainer clip through end of pin in horizontal position.

b. Bottom Panel to Top and Junction Panels

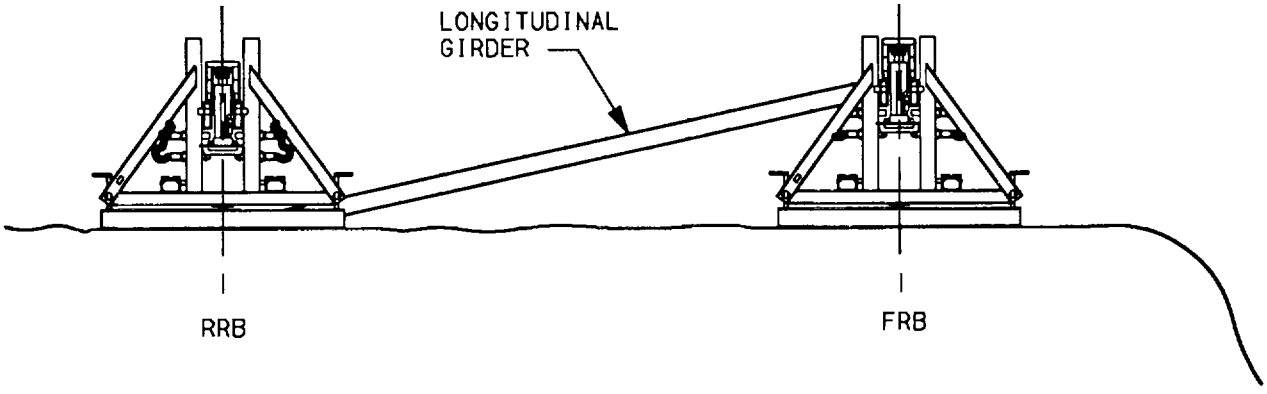
The drill to connect bottom panel to top and junction panels is the same as connecting to top and bottom panels (para. 4-7a.), except there is a headless pin connecting the top and junction panels. A retainer clip must be placed on both ends of the headless pin, after the bottom panel is connected.



4-8. ASSEMBLE FRONT END OF BRIDGE AND FIRST BAY (DOUBLE STORY)

a. General

This procedure covers the assembly of the bankseat beam, end taper panel, top panels C and B, the junction panel and the first bay top and bottom panels on double story bridges. This assembly is called the front end of bridge (EOB) and first bay. When the end of bridge is to be assembled, the front and rear roller beams will be in position with the longitudinal girders as shown (para. 4-5b.).

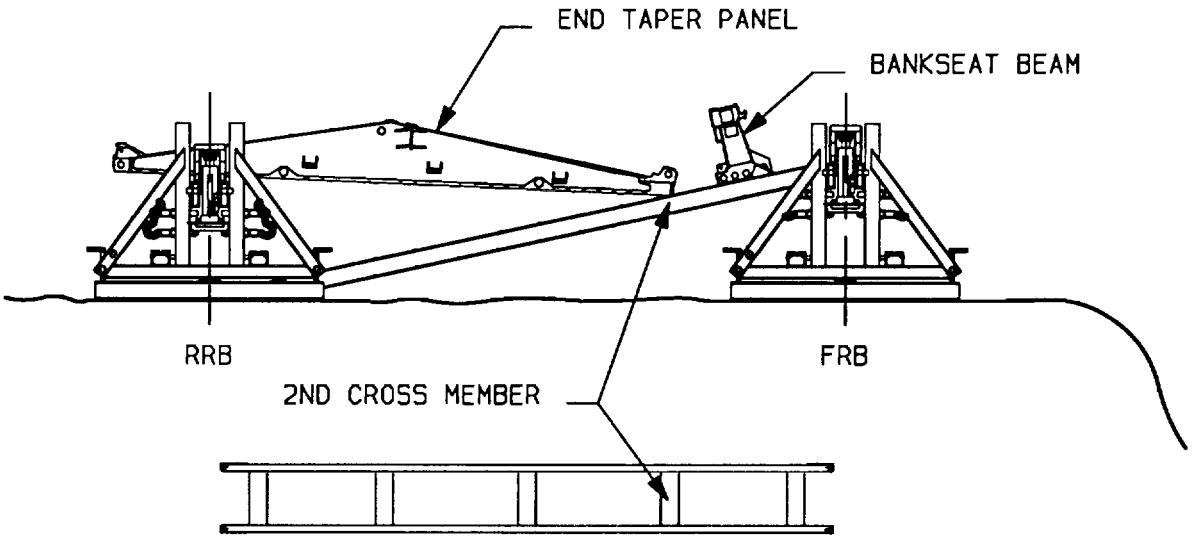


b. Assembly

(1) Ensure both roller beams are level (para. 4-5d.) and that rear roller beam is set lower than front roller beam.

(2) Carry the bankseat beam over the low portion of the longitudinal girders and position it close to the FRB. Two personnel steady the bankseat beam during steps (3) and (4).

(3) Place two end taper panels on the rear roller beam, with the front jaws positioned on the second cross member from the FRB rollers.



NOTE

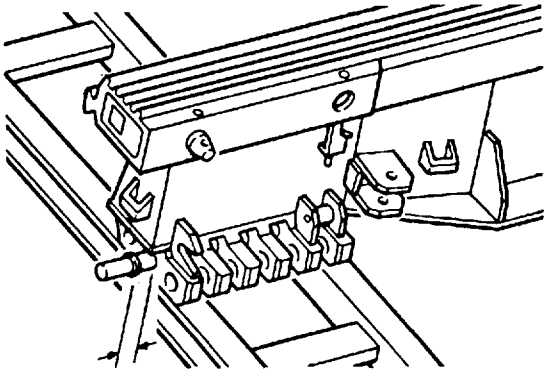
All panel pins are Inserted from the outside of the bridge toward the inside, unless Instructed otherwise.

(4) Place guide (panel) pins into middle panel pin holes on bankseat beam.

(a) On the left side of the bankseat beam, the jaw lug is inset from the side of the bankseat beam, so the guide pin must extend out from the last jaw lug until the shoulder of the guide pin is in line with the side of the bankseat beam.

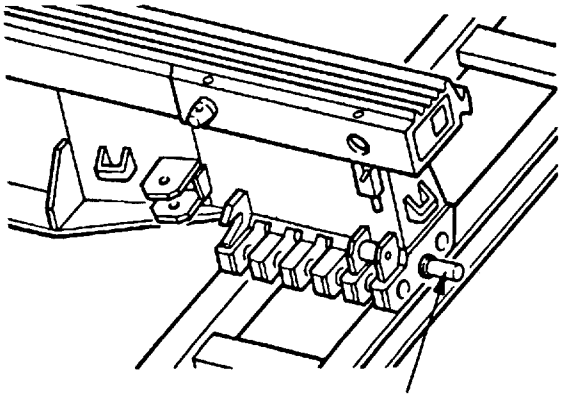
(b) On the right side of the bankseat beam, the jaw lug is flush with the side of the bankseat beam, so the guide pin is inserted until the shoulder of the pin is touching the jaw.

LEFT SIDE



SHOULDER IN LINE
WITH SIDE OF BSB

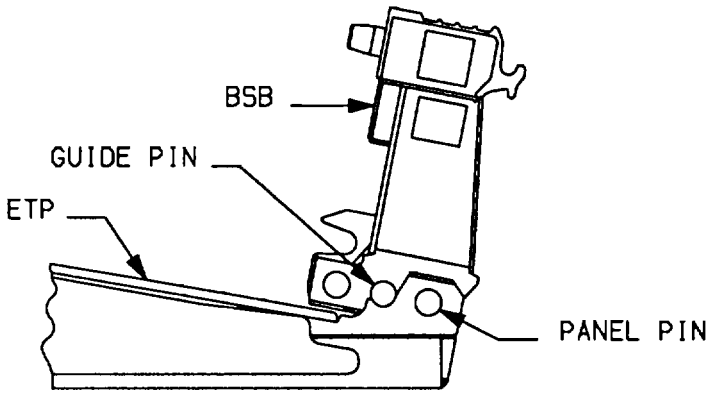
RIGHT SIDE



SHOULDER OF PIN
TOUCHING JAW

(5) Lift bankseat beam onto end taper panels seating the guide pins in the guide pin seats of the end taper panels.

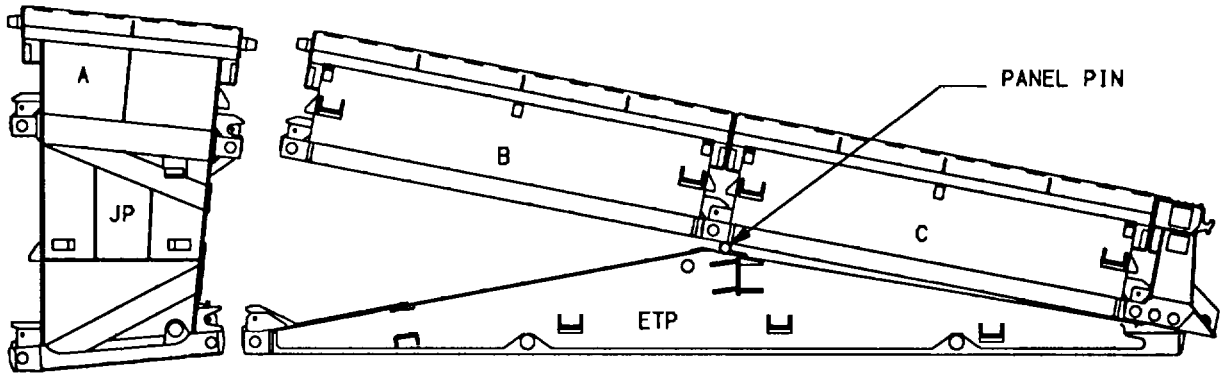
(6) Position two personnel on gap side of bankseat beam, and two personnel on each end taper panel. Insert panel pin in first hole of bankseat beam, do not remove pin once it is started in hole. NCOIC will check gaps at guide pin and seats and direct crews to move end taper panels and bankseat beam as needed to ensure bankseat beam is square to end taper panels.



(7) Connect top panel (C) to bankseat beam.

(8) Raise the top panels and place a panel pin between the top panels and the end taper panel next to the stop on the ETP. This acts as packing to ease the installation of the junction panel.

(9) Connect top panel (B) to (C).



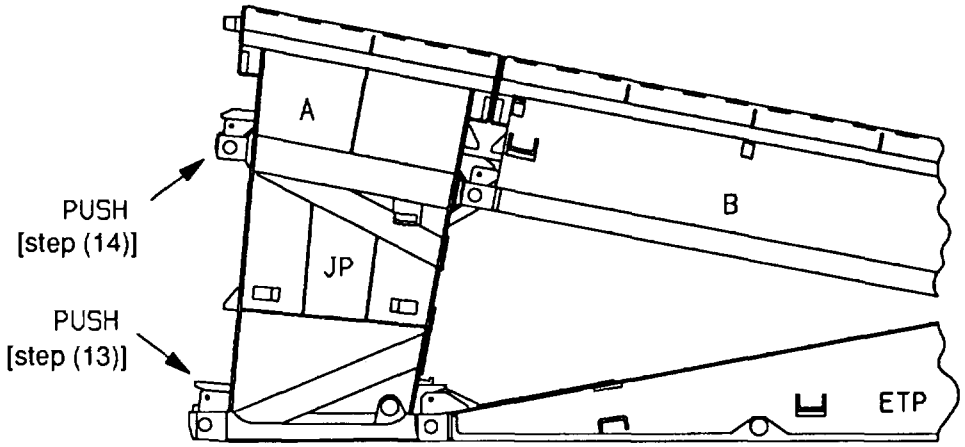
(10) Carry junction panel towards bridge.

(11) Engage dowels and sockets of junction panel and top panel.

(12) When compression faces contact each other, lift the shootbolt and turn handle to the left to lock shoot-bolt.

(13) Lift and push forward to compress bushings and enable pin person to insert bottom panel pin until shoulder touches jaws. Additional person pushes down on bottom jaw to assist.

(14) Push forward with additional person pushing on top jaw to compress top resilient mounts and enable pin person to insert panel pin in upper jaw until shoulder touches jaw.



(15) Put retainer clips on both pins.

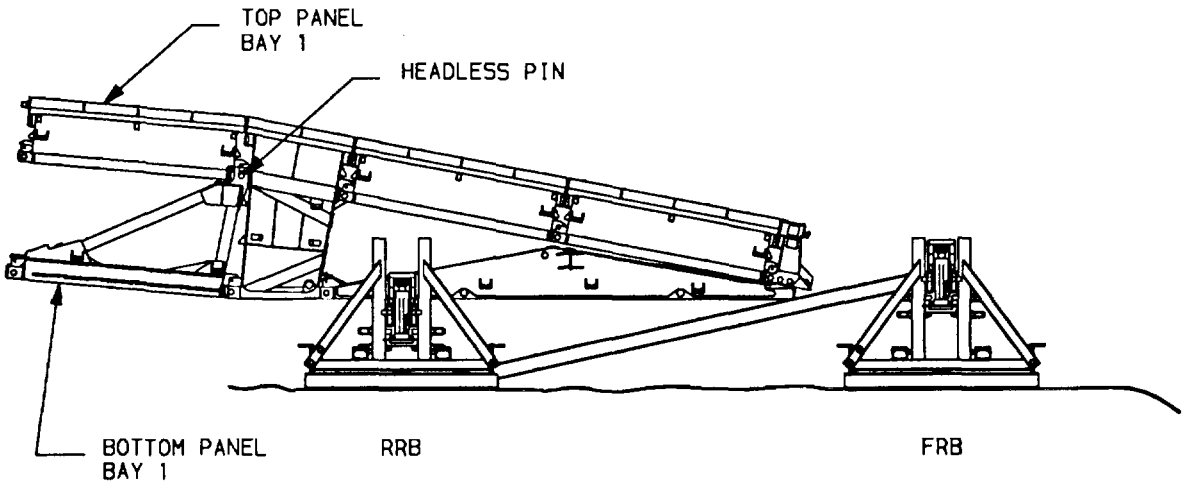
(16) Remove panel pin from between top panels and end taper panels.

(17) Add bay 1 top panels (para. 4-6c.), using a headless pin. Insert headless pin through jaws until an equal amount of pin is showing on both sides of top panel. DO NOT put retainer clips in until bottom panel is added.

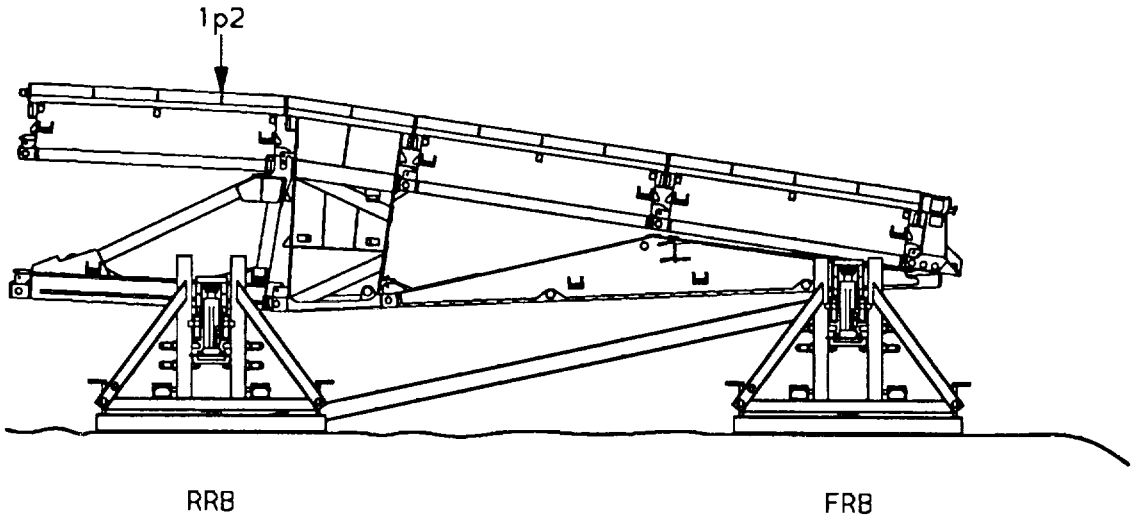
NOTE

A headless pin must be used here If there Is any chance the bridge will be delaunched and disassembled on the far bank. Good practice Is to always use a headless pin in this position even If it Is known the bridge will be pulled back to the near bank.

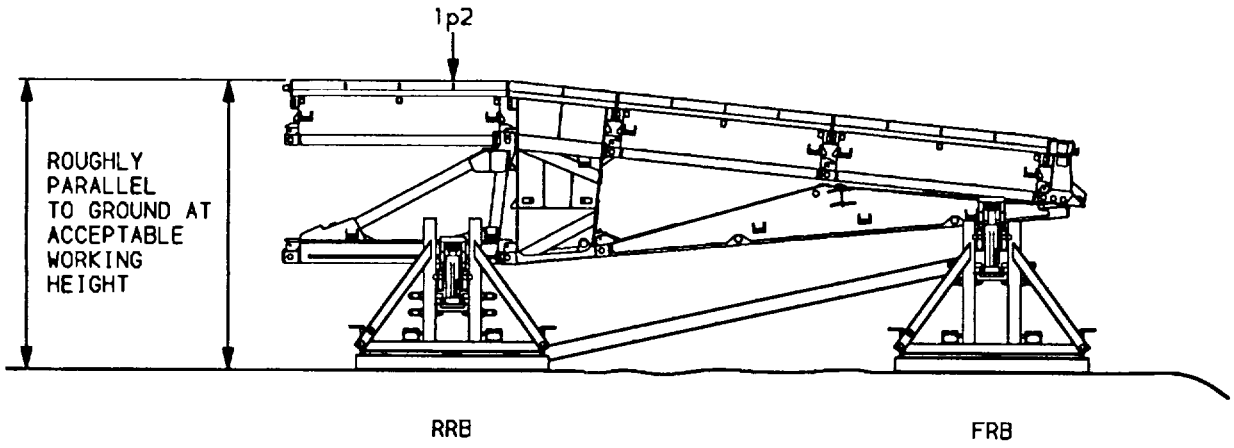
(18) Add bay 1 bottom panels.



(19) Position 16 personnel around end of bridge, lift and carry bridge forward until end taper panels rest on front roller beam rollers and panel point 1p2 is over rear roller beam rollers. Lock rollers.



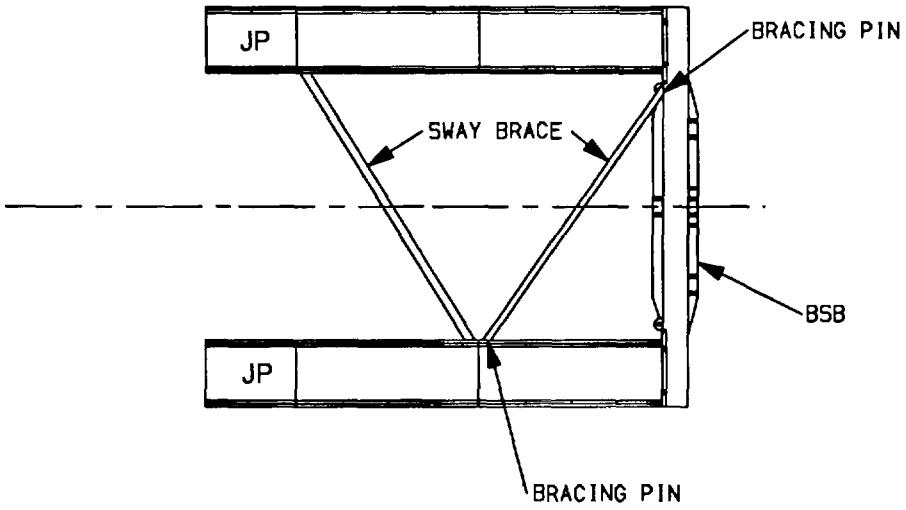
(20) Adjust the height and level of front and rear roller beams so the top panels are roughly parallel to the ground to prevent difficulty in lifting top panels into place. Level roller beams at the adjusted height so girders of bridge are on the same horizontal plane and at an acceptable working height.



NOTE

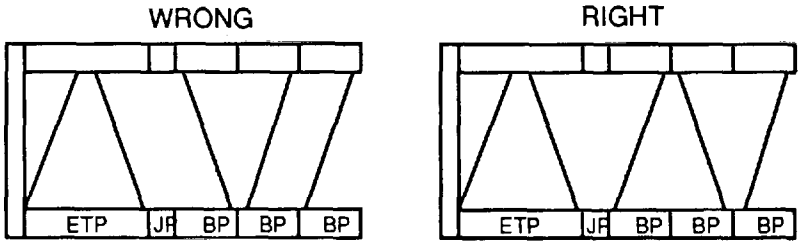
The NCOIC and side party leaders must continually monitor the height of the rear of the bridge to prevent difficulty in lifting top panels into place. Failure to think ahead will slow bridge construction and could create safety hazards for the work party.

(21) Connect sway brace from bankseat beam to center of end taper panel. Add another sway brace from center of same end taper panel to rear of other end taper panel.



NOTE

To prevent problems pinning sway braces, always pin the end of the brace that is closest to the gap first, then the other end. It may also be necessary to spread the girders of the bridge to align the holes and insert the bracing pins. Sway bracing must be placed so that it forms a zig-zag pattern.

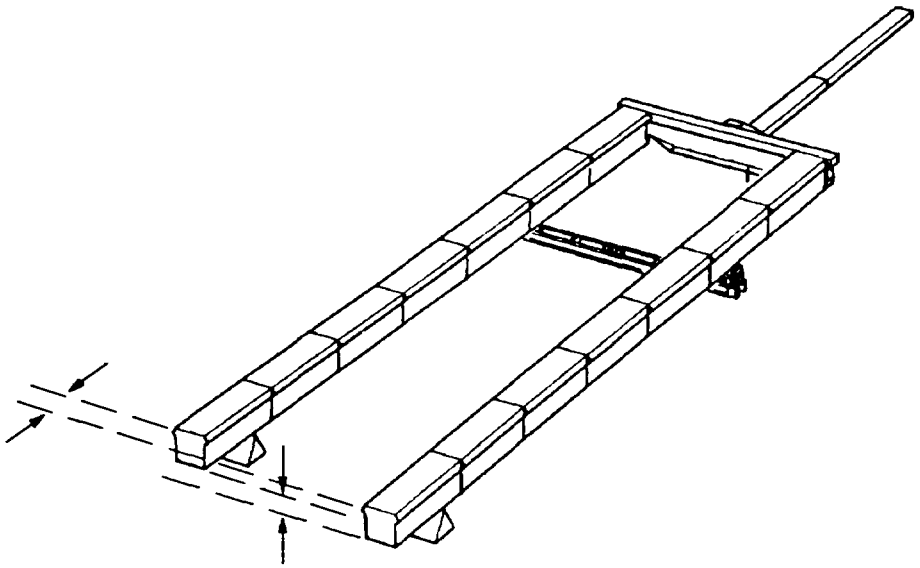


(22) Do not add sway brace in bay 1 at this time. This will be added when the launching nose has been assembled.

4-9 ASSEMBLE REAR END OF BRIDGE

a. Single Story

On single story bridges, when connecting the rear bankseat beam to top panels, it is likely that two girders of the bridge will be on different levels, and not square with the bankseat beam.



The bridge will be supported on the rollerbeam and building pedestals, and it is necessary to level and square the girders so that the bankseat beam will connect to the top panels. This is achieved by:

(1) Remove building pedestal from under higher girder (B) so its end can be lowered as well as raised.

(2) Two personnel steady the rear most panel on girder (B).

(3) Unlock the roller beam roller under girder (B) so that it can move over the roller.

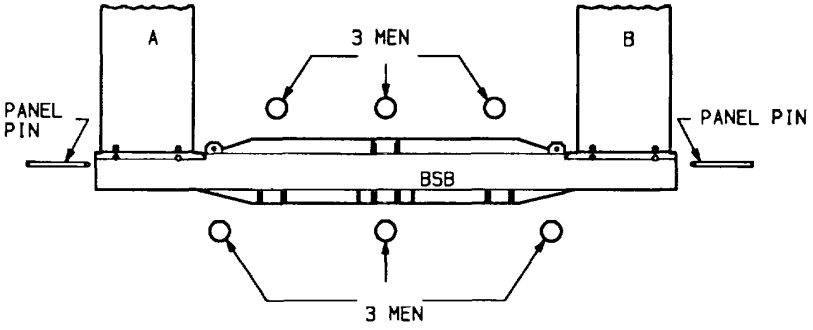
(4) Engage the dowels and sockets of bankseat beam and top panel of girder (A). DO NOT close shoot-bolts.

(5) Move free girder (B) sideways, if necessary, to engage dowels and sockets of bankseat beam and top panel of girder (B).

(6) Move bankseat beam sideways in the appropriate direction to make the gaps between the compression faces parallel.

(7) Raise/lower bankseat beam at the end of girder (B) until all shootbolts can be closed.

(8) Insert panel pins into bankseat beam and top panels as three personnel on inside of bankseat beam lift, and three personnel on outside bankseat beam push down, to compress the resilient mounts.



(9) Put retainer clip through end of panel pins.

b. Double Story

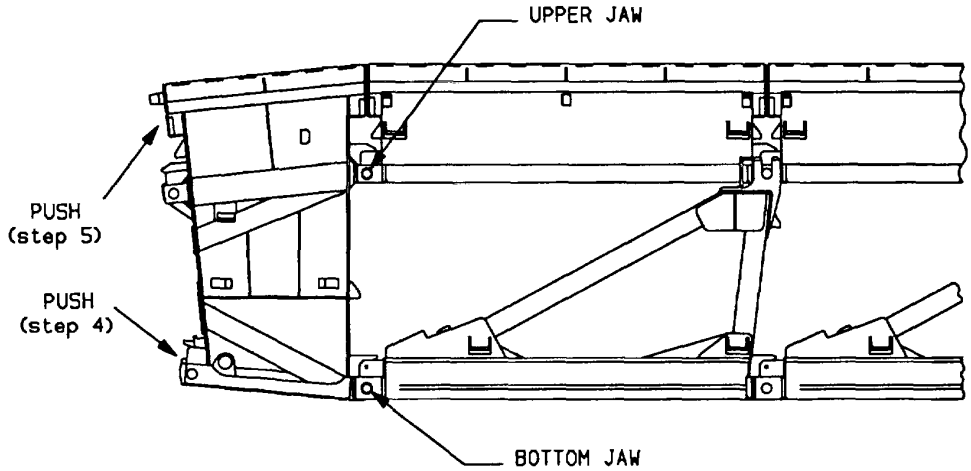
(1) Carry junction panel towards last bay of bridge.

(2) Engage dowels and sockets of junction panel to top panel.

(3) When compression faces contact, lift the shootbolt and turn handle to the left to lock shootbolt.

(4) Lift and push forward to compress resilient mounts and enable pin person to insert bottom panel pin until shoulder touches jaw. Additional person to push down on bottom jaw to assist.

(5) Push forward with additional person pushing on top jaw to compress resilient mounts and enable pin person to insert panel pin in upper jaw until shoulder touches jaw.



(6) Put retainer clips on both pins.

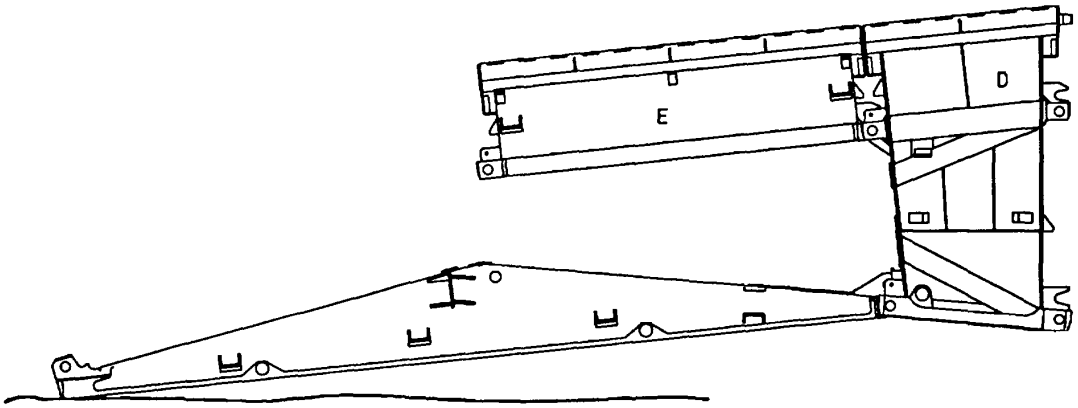
(7) Connect top panel (E) to junction panel (para. 4-6a.).

(8) Carry end taper panel towards junction panel and engage resilient mounts in guide slots to line up pin hole in jaws.

(9) Slide in panel pin until shoulder butts against jaws.

(10) Lower other end of end taper panel to the ground.

(11) Put retainer clip through end of pin.



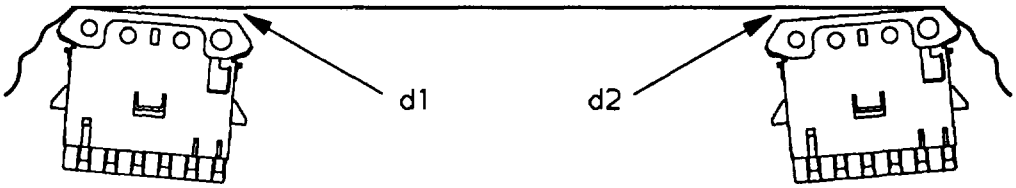
NOTE

During construction constant checks should be made to ensure both roller beams and capsill roller beam are level. This will ease connection of bankseat beam to end taper panel and ensure pins can be Inserted.

To complete the end of bridge it may be necessary to reduce the girder toe in and to level the end of bridge. This is a result of the roller beams not being level, the following is an example:

(12) Hold a piece of string across the same point of top panels.

(13) Check gaps at points dl and d2. These gaps must be the same before girders are considered level.



(14) To adjust the gaps at dl and d2:

(a) To increase gap at dl, lower rear roller beam or raise forward roller beam on that side of bridge.

(b) To decrease gap at d2, raise rear roller beam or lower forward roller beam on that side of bridge.

(15) When dl and d2 are equal, the girders are considered level enough to complete the end of bridge for bridges up to 12 bays.

WARNING

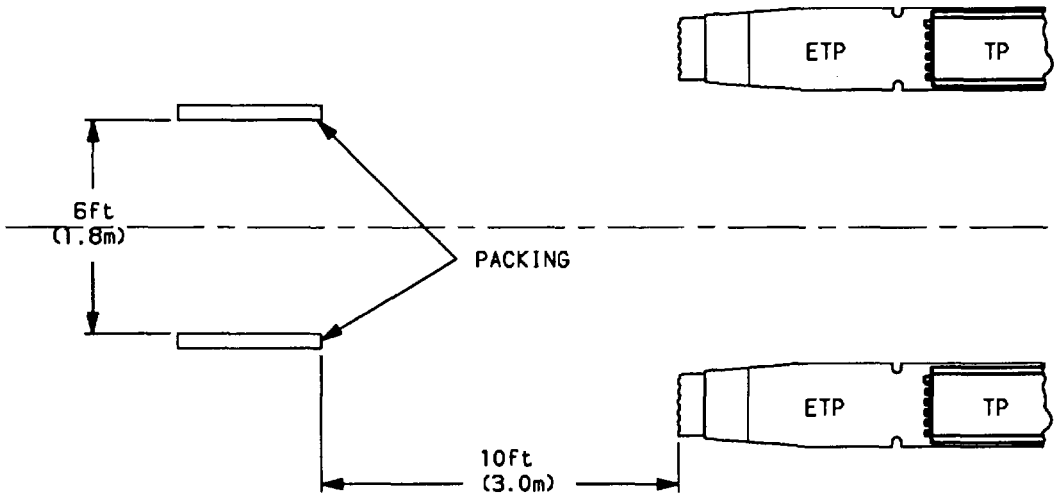
The Big U method of completing the end of bridge requires a total lift of 1330lb waist high and walk with it. Caution should be used if this method Is chosen.

NOTE

There are two methods of completing the end of bridge. One is called the Big U, the other is simply piece by piece. The method chosen Is determined by the NCOIC. For Big U see step (16) (a) to (i). For piece by piece, see step (17) (a) to (h).

(16) To complete end of bridge using Big U method:

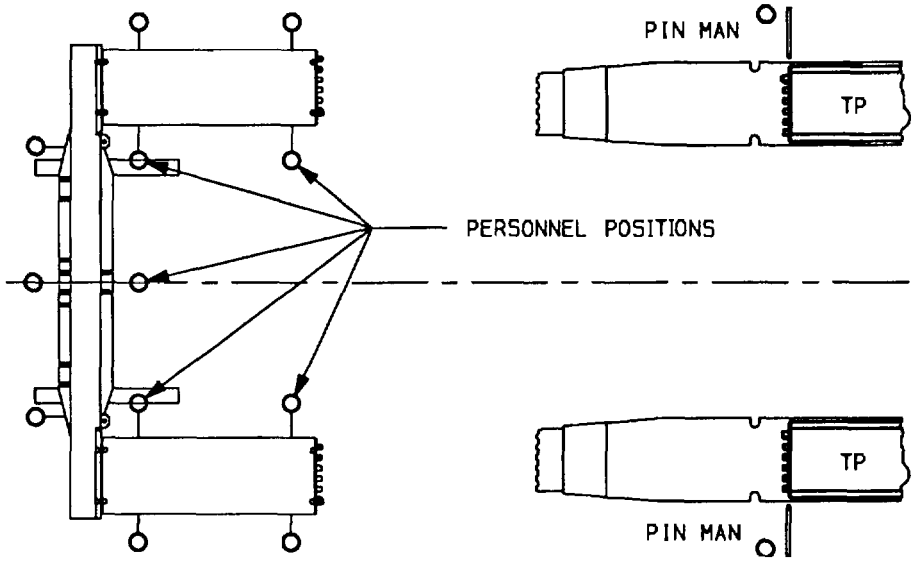
(a) Place two pieces of packing about 6 ft (1.8 m) apart, 10 ft (3.0 m) from rear of end taper panels.



(b) Place the bankseat beam on the packing.

(c) Pin a top panel to each end of the bankseat beam. This completes the Big U.

(d) Lift the Big U using a minimum of 14 personnel (maximum of 24) positioned as shown. NCOIC will determine whether to have one or two personnel in each position. The personnel must be distributed evenly around the Big U.



(e) Align the dowels and sockets of top panels in the Big U with those of top panels attached to junction panels.

(f) When compression faces contact each other, lift and turn shoot bolts to left to lock.

(g) Let the Big U down to engage resilient mounts of top panel.

NOTE

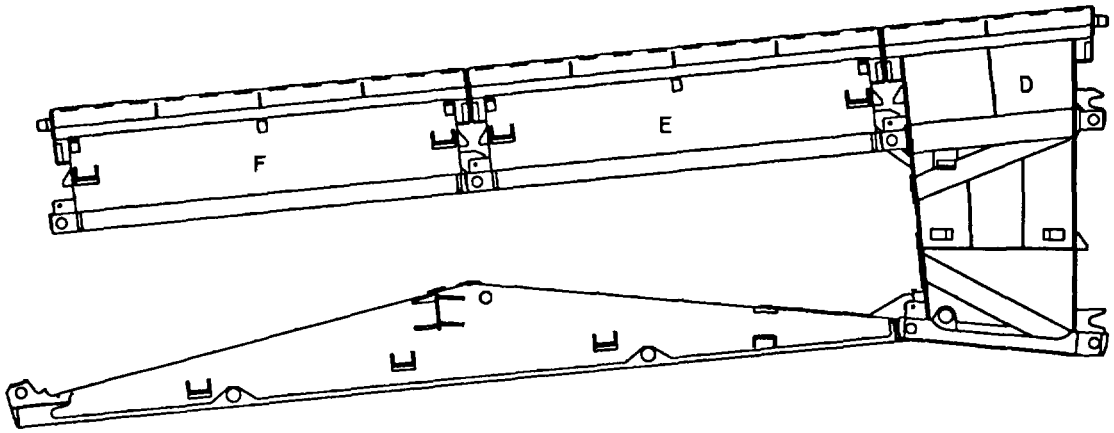
It may be necessary to lift the Big U slightly to Insert the panel pins In the top panels. This Is because the weight of Big U over compresses the resilient mounts.

(h) Insert panel pin through top panels until shoulder touches jaws. Add retainer clips.

(i) Proceed to step (18) to connect end taper panel to bankseat beam.

(17) To complete end of bridge using piece by piece method.

(a) Connect top panels F to top panels E.

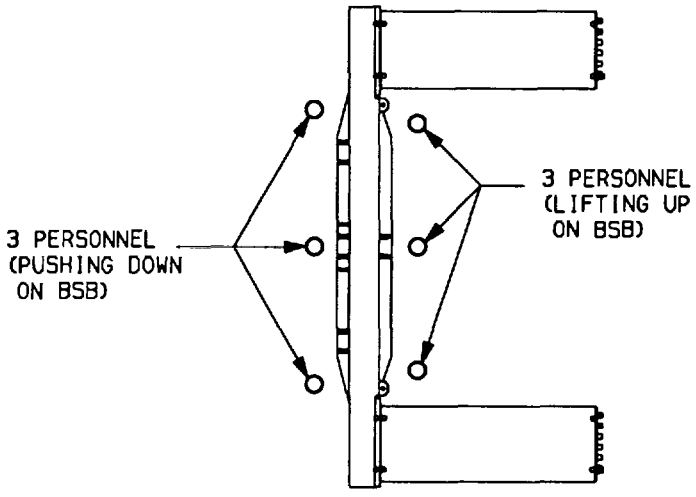


(b) Lift and carry bankseat beam to rear of bridge.

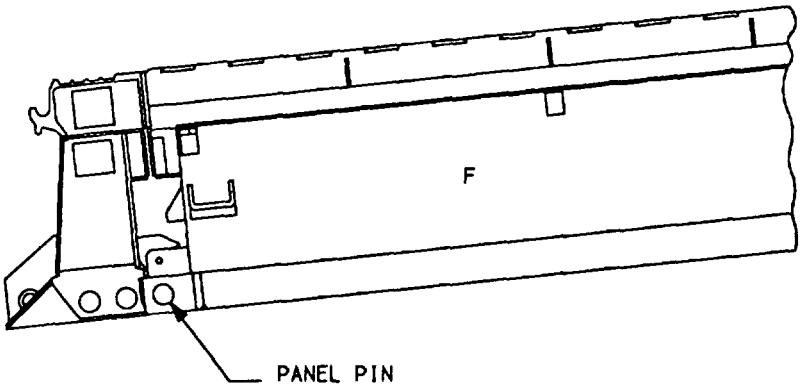
(c) Align dowels and sockets of bankseat beam with those of top panels.

(d) When compression faces contact each other, lift and turn shootbolts to lock bankseat beam to top panels.

(e) With three personnel lifting on inside of bankseat beam, and three personnel pushing down on the outside of beam compress resilient mounts.



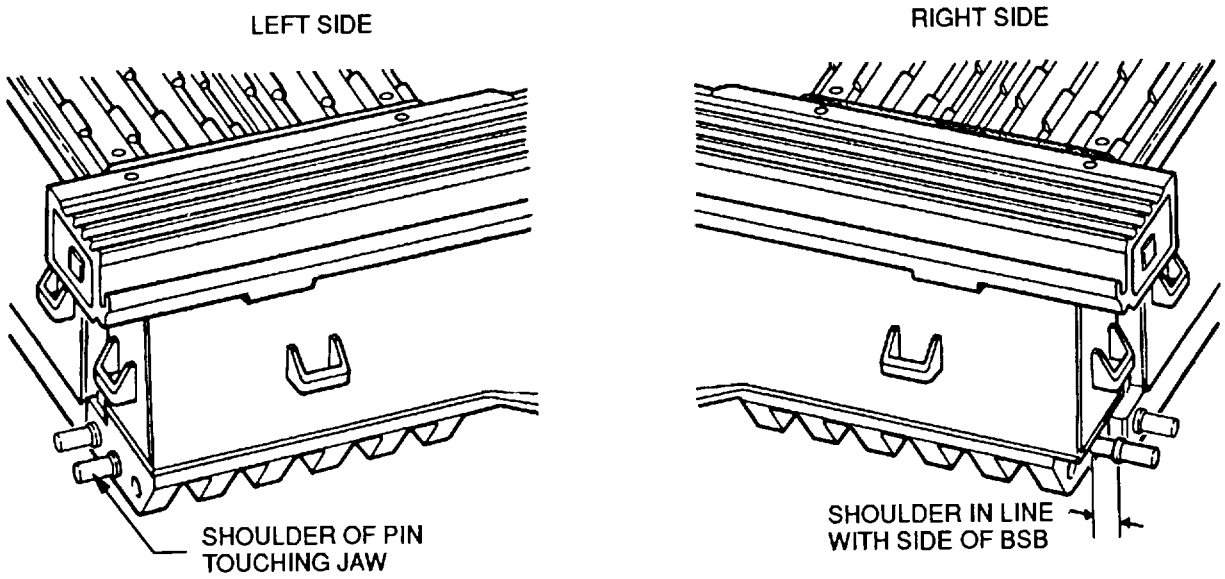
(f) When resilient mounts are compressed insert panel pin through the pin holes until shoulder touches jaws.



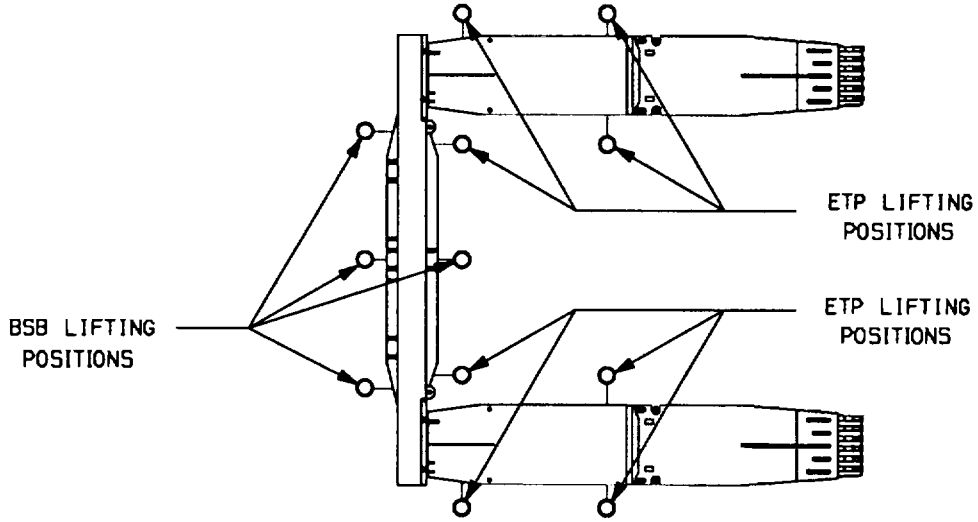
(g) Put retainer clips through the end of panel pins.

(h) On the left side of the bankseat beam, the jaw lug is inset from the side of the bankseat beam, so the guide pin must extend out from the last jaw lug until the shoulder of the guide pin is in line with the side of the bankseat beam.

(i) On the right side of the bankseat beam, the jaw lug is flush with the side of the bankseat beam, so the guide pin is inserted until the shoulder of the pin is touching the jaw.



(18) Position 14/24 personnel on the end taper panels and bankseat beam as described in step (16) (d). The top panel personnel will now transfer to the end taper panels.



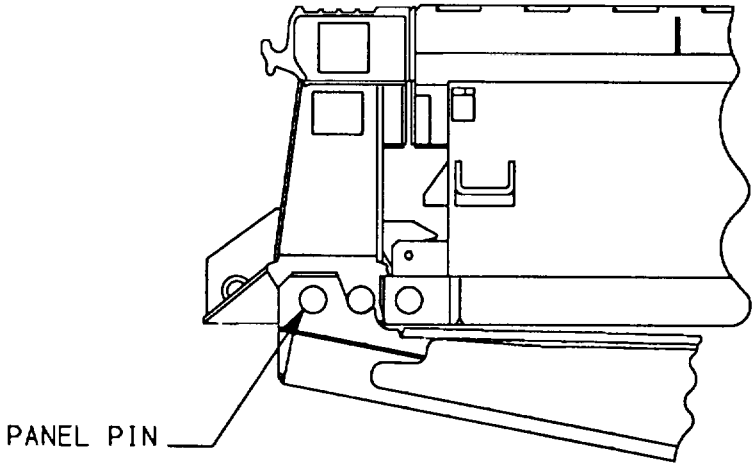
(a) With all personnel, lift end taper panels and bankseat beam until guide pins seat in slots of end taper panels.

NOTE

Once this panel pin has started Into pin jaws of end taper panel and bankseat beam, DO NOT REMOVE IT, unless the presence of dirt or other debris prevents the pin from being fully seated. Leaving the pin part way in will allow the work party to take a slight break and to get a new hold on their carrying bars.

(b) Insert panel pin in outer pin hole of bankseat beam and end taper panel.

(c) Do not put retainer clip through the panel pin, it is not required.



(d) Let end of bridge down.

(e) Connect sway brace from rear of end taper panel to center of other end taper panel. Add another sway brace from center of same end taper panel to bankseat beam.

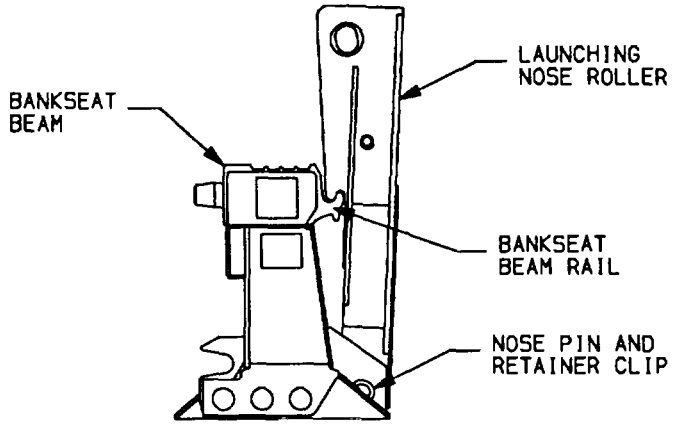
4-10. CONNECTING LAUNCHING NOSE ROLLER

The launching nose roller and launching nose cross girder supports the launching nose on single story bridges over 8 bays, and all double story bridges. To connect the launching nose roller to the bankseat beam proceed as follows:

a. Hook the nose roller on bankseat beam rail.

b. Push launching nose pin through bankseat beam center bracket and bottom of nose roller.

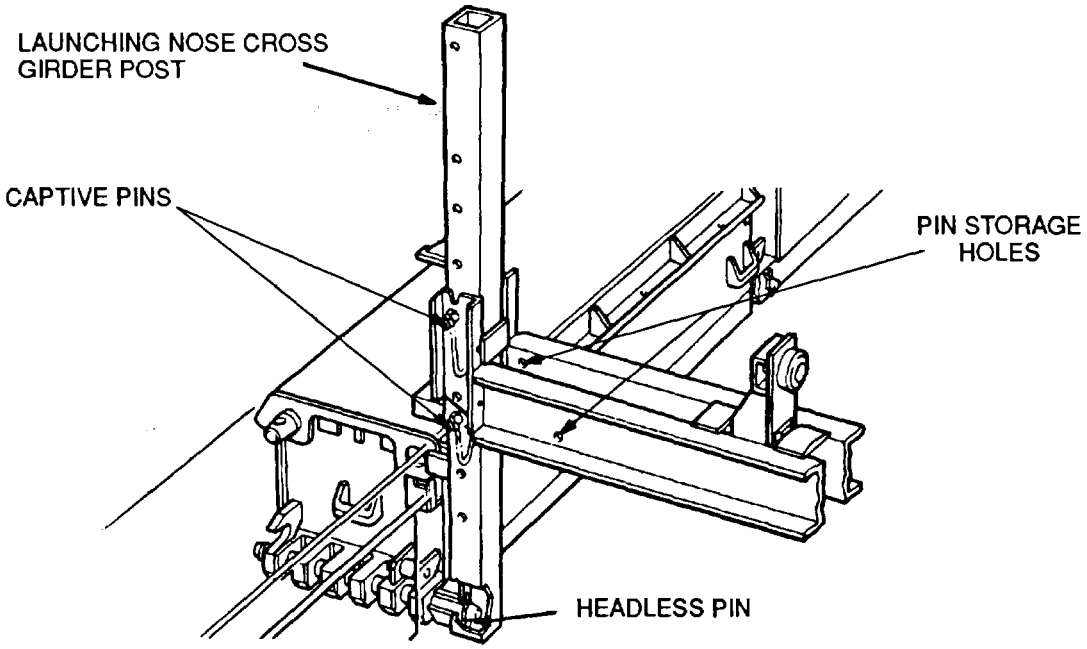
c. Put retainer clip through nose pin.



4-11. CONNECTING/DISCONNECTING LAUNCHING NOSE CROSS GIRDER & POSTS

The launching nose cross girder holds the near bank end of launching nose in position set for construction and launch. The drills for connecting are slightly different for SS and DS, but the drill for setting position is the same.

a. Single Story



(1) Remove the inside retainer clip from headless pins at junction of bays 2 and 3.

(2) Fit nose cross girder posts to the headless pins at junction of bays 2 and 3. Center lug of post connects to the compression faces of the two top panels.

(3) Put retainer clip back onto headless pin. This will keep the nose cross girder post from slipping off headless pin.

(4) Slide launching nose cross girder up posts to correct setting (para. 4-11c.). Insert captive pin in lower hole position determined by design.

(5) Lower post jaw onto captive pin then insert top pin in top pin hole.

(6) Put retainer clips through end of captive pins.

(7) After the bridge is launched remove the assembly by:

(a) Reposition the deck unit next to the launching nose cross girder and posts.

(b) Support launching nose cross girder on both sides of bridge and remove captive pins (place captive pins in storage holes).

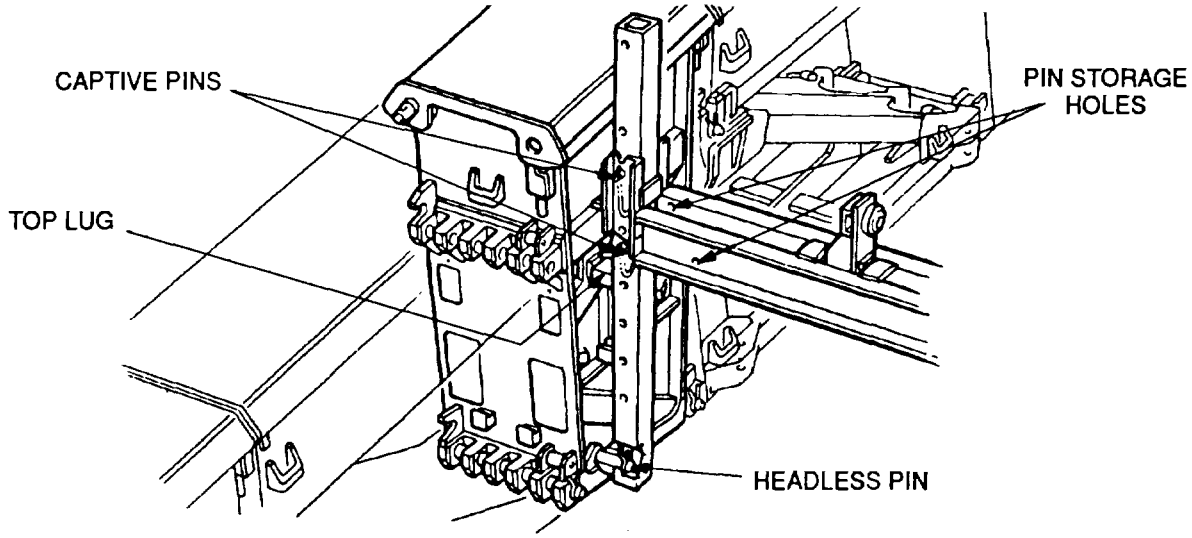
(c) Raise girder until it clears posts and place it on the deck unit.

(d) Remove clip from headless pin.

(e) Remove posts.

(f) Carry the launching nose cross girder to the end of the bridge.

b. Double Story



(1) Put a headless pin into the pin hole in the junction panel.

(2) Place the launching nose cross girder post onto the junction panel top lug, then over the headless pin.

(3) Place retainer clips on both ends of headless pin.

(a) Inside retainer clip will keep nose cross girder post from slipping off headless pin.

(b) Outside retainer clip will keep pin from working out of hole.

(4) Carry the launching nose cross girder over the rear roller beam and slide girder up the posts to correct setting (para. 4-11c.).

(5) Position the captive pin at the position chosen by design and lower post jaw onto captive pin, then insert top pin in top pin hole.

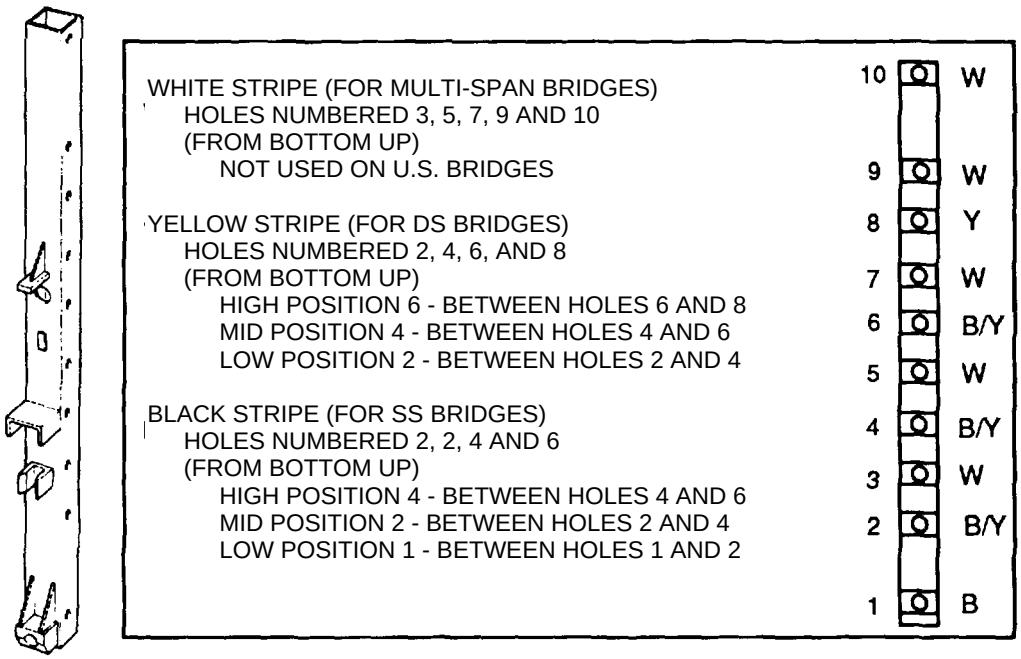
(6) After the bridge is launched remove the assembly as described in paragraph 4-11a. step (7). It will be necessary to have personnel positioned inside the bridge at the junction panel. Two cargo-tie down straps can be used to ease the lifting of the launching nose cross girder.

c. Setting Launching Nose Cross Girder

The launching nose cross girder can be positioned at various heights to accommodate differences in bank heights. The nose cross girder posts are marked to indicate the different positions. The final position of the launching nose cross girder is determined by design.

WARNING

During following procedure NCOIC must ensure that CG of bridge remains between roller beams when launching nose is boomed [steps (2) and (8)]


WHITE STRIPE (FOR MULTI-SPAN BRIDGES)
HOLES NUMBERED 3, 5, 7, 9 AND 10
(FROM BOTTOM UP)
NOT USED ON U.S. BRIDGES
YELLOW STRIPE (FOR DS BRIDGES)
HOLES NUMBERED 2, 4, 6, AND 8
(FROM BOTTOM UP)
HIGH POSITION 6 - BETWEEN HOLES 6 AND 8
MID POSITION 4 - BETWEEN HOLES 4 AND 6
LOW POSITION 2 - BETWEEN HOLES 2 AND 4
BLACK STRIPE (FOR SS BRIDGES)
HOLES NUMBERED 2, 2, 4 AND 6
(FROM BOTTOM UP)
HIGH POSITION 4 - BETWEEN HOLES 4 AND 6
MID POSITION 2 - BETWEEN HOLES 2 AND 4
LOW POSITION 1 - BETWEEN HOLES 1 AND 2
10 W
9 W
8 Y
7 W
6 B/Y
5 W
4 B/Y
3 W
2 B/Y
1 B

It is easier to construct the launching nose in middle position. Setting the nose cross girder in a high position involves difficult lifts, which can be avoided by following this drill:

(1) Set the nose cross girder in middle position.

(2) Construct the nose in the usual way but only boom until its balance point is over the nose roller.

(3) Place a panel pin through the nose roller and launching nose to prevent nose from rolling.

(4) Hold rear of nose and unpin nose cross girder.

(5) Re-pin the nose cross girder in the next hole.

(6) Continue this drill (4) and (5) until the correct setting is reached.

(7) Put retainer clips in captive pins.

(8) Remove pin through nose roller and boom to final position.

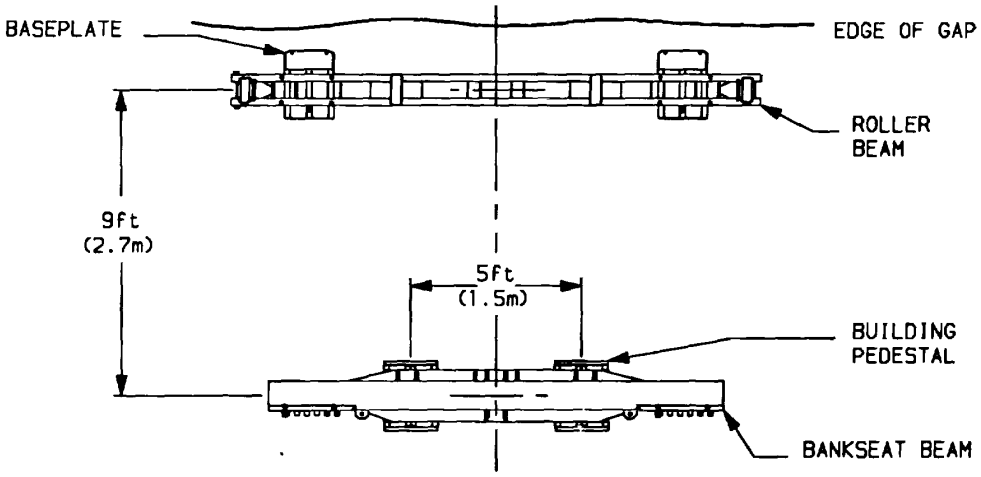
(9) Insert panel pin through nose roller and anchorage tube at center of last but one nose unit.

(10) Put retainer clip through end of panel pin.

4-12. ASSEMBLING LAUNCHING NOSES FOR LAUNCH

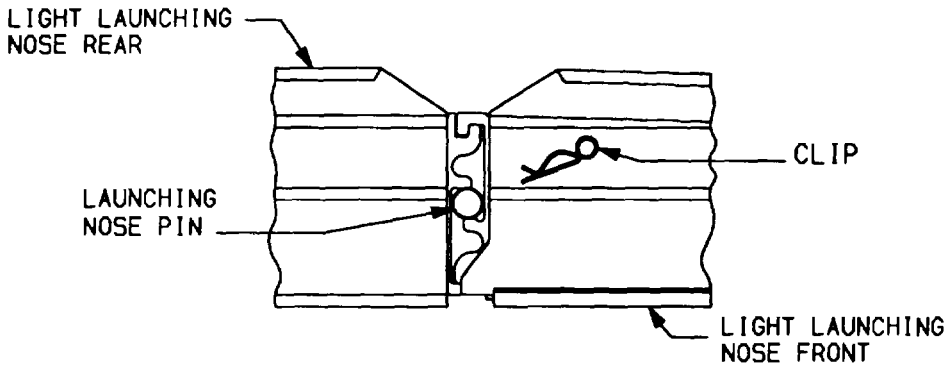
a. Single Story 1 thru 8 Bay

The launching system for single story bridges up to 8 bays consists of the light launching nose (LLN) front and rear connected to the bankseat beam. When the LLN is to be connected to the bankseat beam, the bankseat beam will be on building pedestals, 9 ft behind the roller beam.



(1) Use a launching nose pin to pin the front and rear sections of the light launching nose together.

(2) Put a retainer clip through end of nose pin.



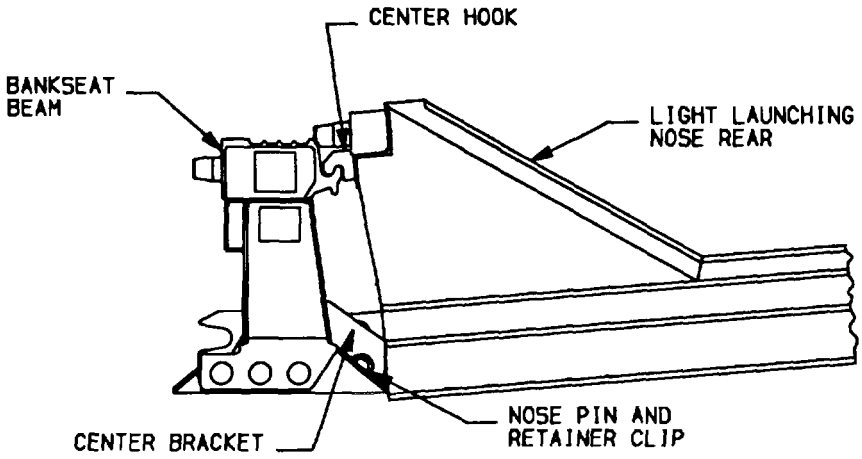
(3) Connect rear of light launching nose to bankseat beam.

(a) Bring nose over back of bankseat beam.

(b) Center hook of light nose rear section fits into ramp ledge of bankseat beam.

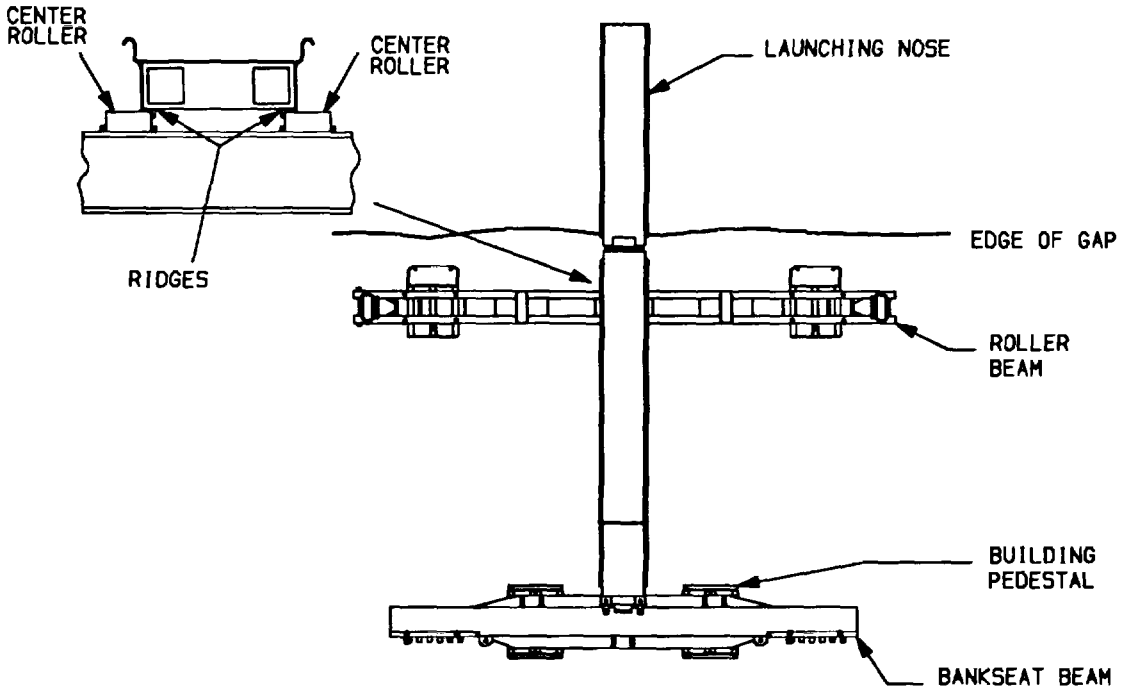
(c) Put a nose pin through launching nose jaws and bankseat beam center bracket.

(d) Put a retainer clip through end of nose pin.



(e) Let launching nose rest on center rollers of roller beam.

(f) Check that ridges on bottom of nose sections are located between inside edges of rollers.



4-37

b. Single Story 8 thru 12 Bay- Double Story 2E + 1 thru 2E + 18

Single story bridges over 8 bays long, and double story bridges up to 18 bays without link reinforcement use a combination of light launching nose and launching nose heavy, supported on the launching nose roller (para. 4-10) and launching nose cross girder (para. 4-11).

NOTE

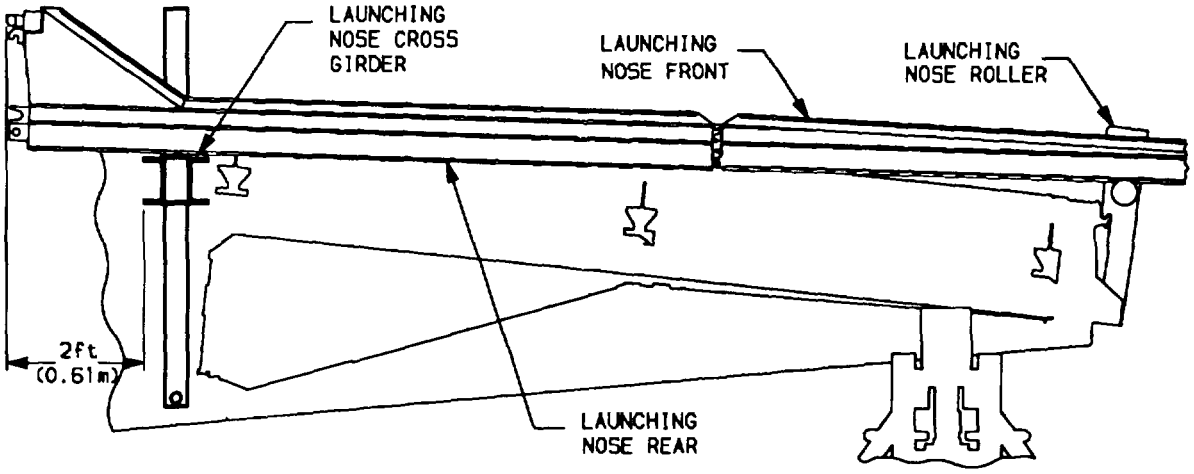
The drill for a 12 bay double story bridge Is shown below as an example for assembling launching noses. When building other lengths and types of bridge, booming or building may occur during the construction of the nose. ALWAYS follow the build and boom table or build procedure for the bridge being built.

(1) Set nose cross girder in middle position (para. 4-11c.).

(2) Using a nose pin, pin front and rear sections of light nose together.

(3) Put retainer clip through end of nose pin.

(4) Place front end of light nose section on nose roller and rear end on nose cross girder. Rear of nose section should extend about 2 ft (0.61 m) behind cross girder.



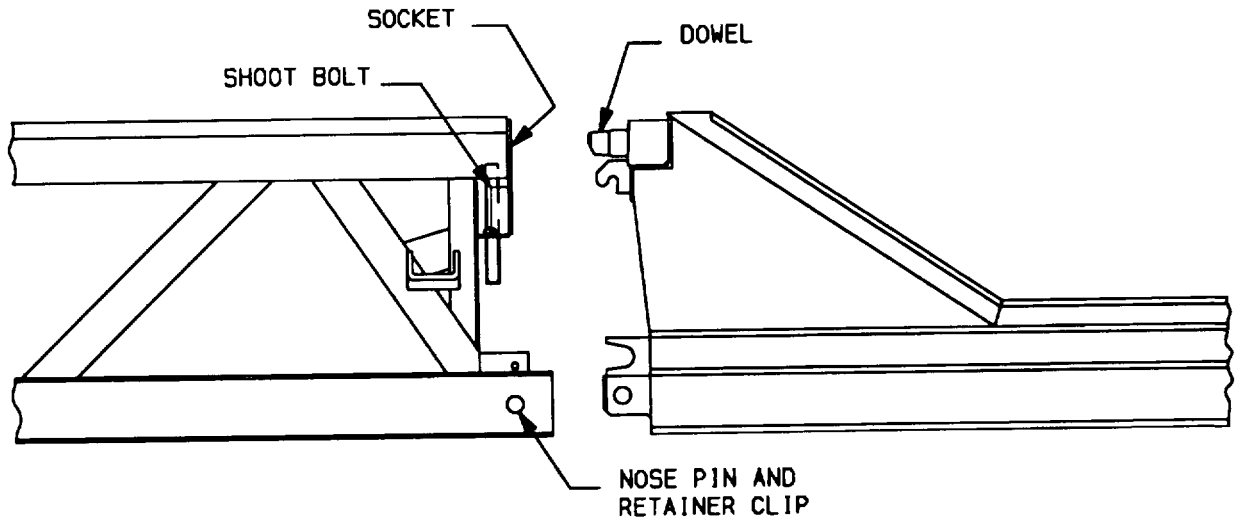
(5) Pin first heavy nose section to end of light nose section. This must remain supported until step (8) is complete.

(a) Fit sockets of heavy nose onto dowels of rear light nose resting on nose cross girder.

(b) Lift and push shoot bolts through dowels and turn handles to locked position.

(c) Push nose pin through jaws of nose sections.

(d) Put retainer clip through the end of nose pin.

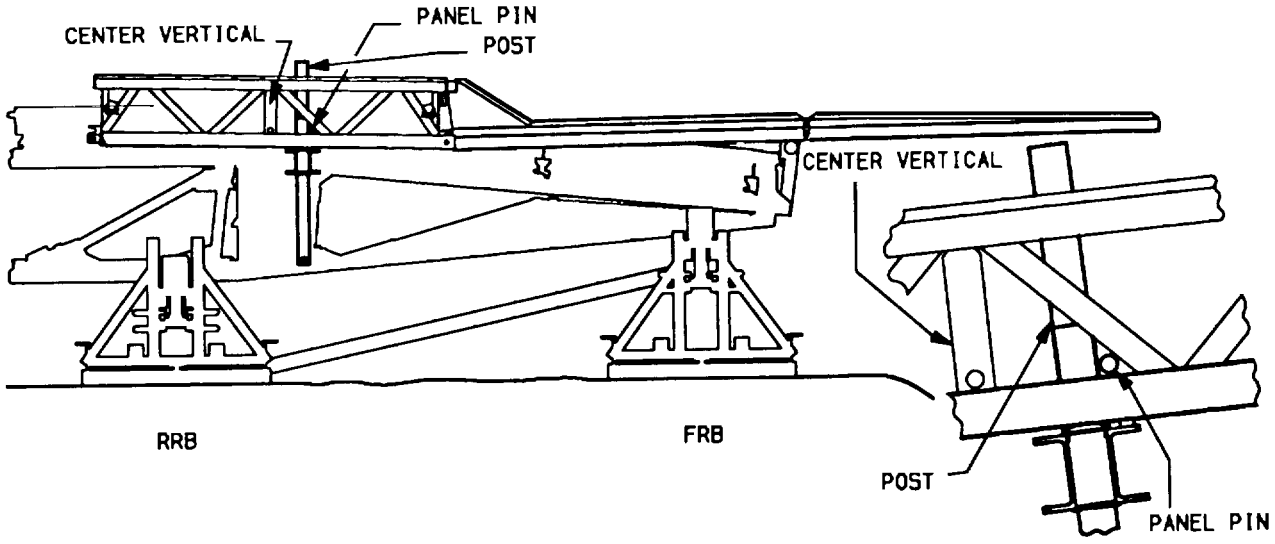


(6) Raise gravity catch handle on nose cross girder.

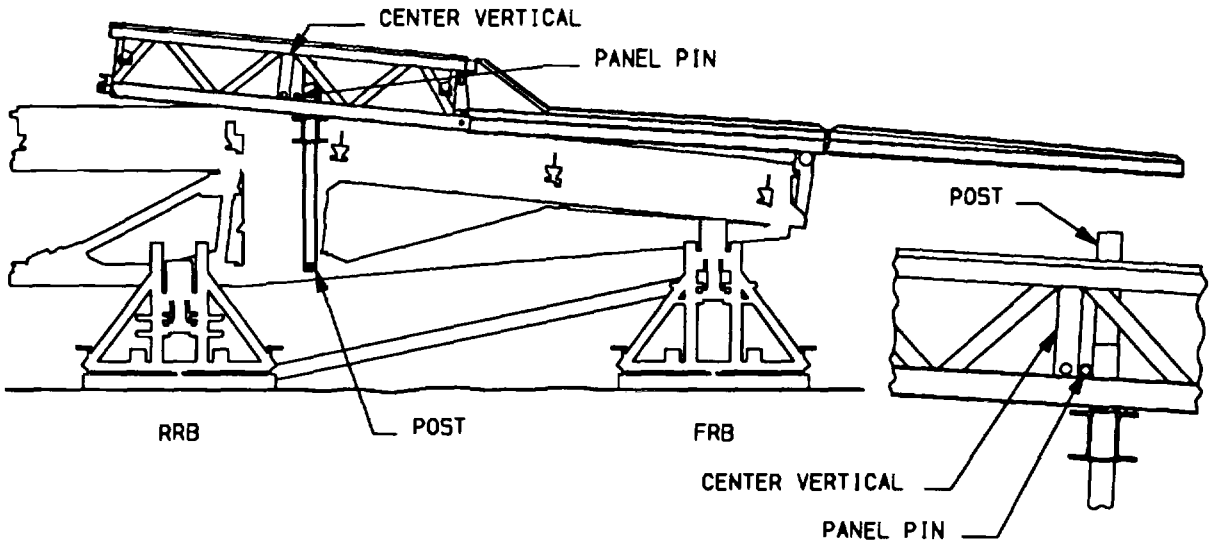
(7) Push nose forward until junction of light launching nose front and light launching nose rear is next to nose roller.

(8) Secure the nose as follows:

(a) If tip of nose is uphill, put panel pin through the nose between the LNCG rollers and center diagonal.



(b) If tip of nose is downhill, put panel pin through the nose between the LNCG rollers and center vertical.



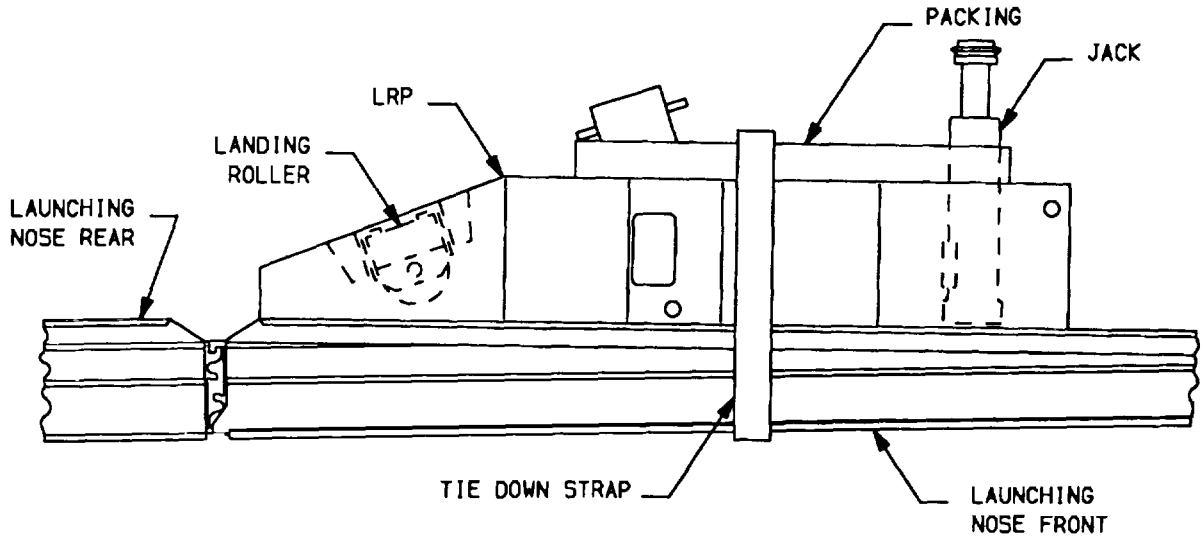
(9) Put landing roller pedestal (LRP) and landing roller on light launching nose front, with the edge of the LRP next to the junction of the light nose front and light nose rear.

(a) Put one 15 ton jack (ram fully extended) in landing roller pedestal standing upright.

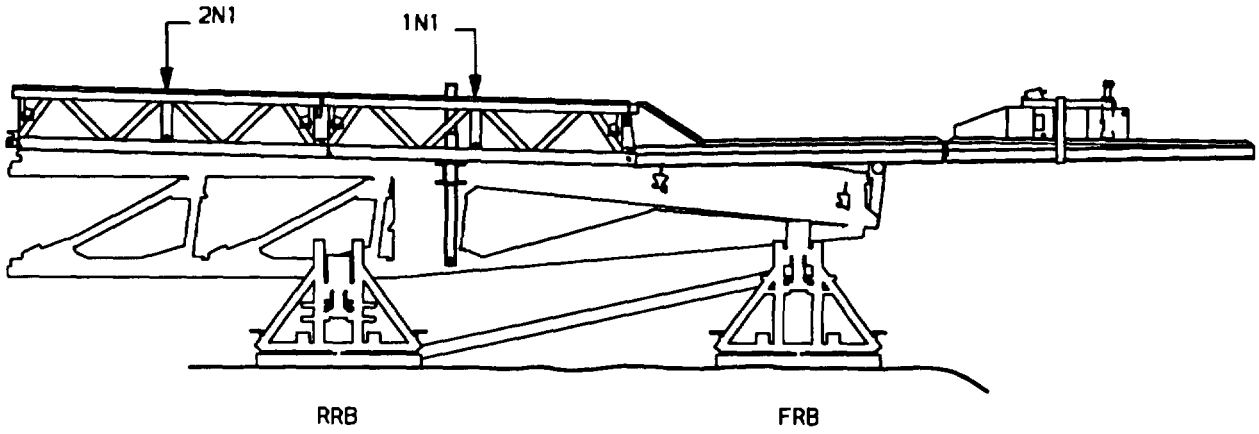
(b) Put two pieces of packing on landing roller pedestal.

(c) EITHER carry LRP round the front of the bankseat beam and lift onto light launching nose, OR lift LRP onto one girder of bridge and slide along bankseat beam and position on light launching nose.

(d) Secure LRP to nose with cargo tie-down strap.

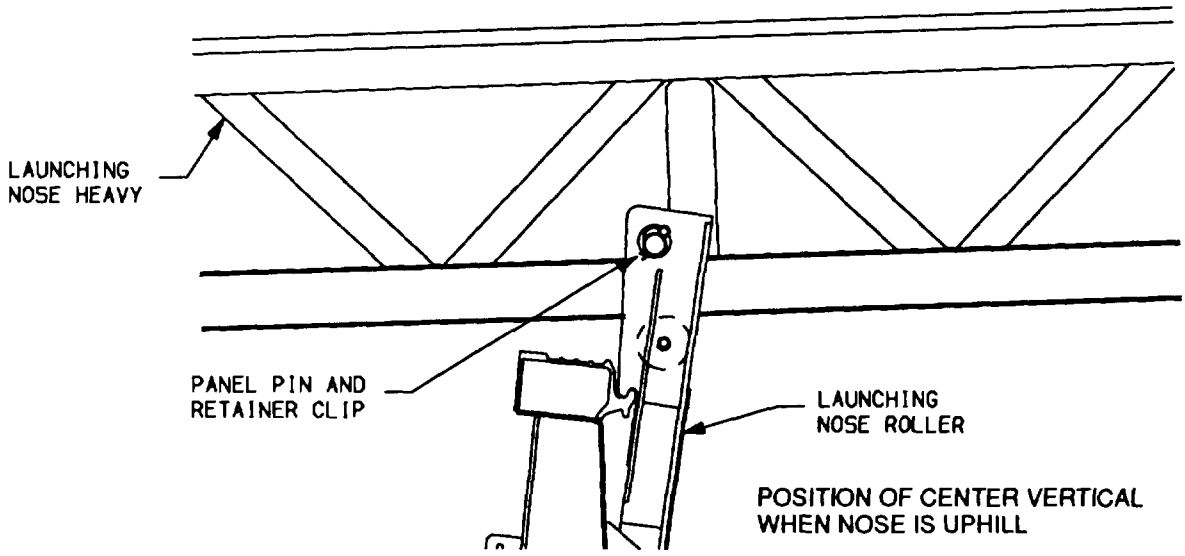


(10) Connect second heavy nose section (2N1) to first heavy nose section.



(11) Lift gravity catch, remove panel pin, and push nose forward until center vertical in first heavy nose section is close to anchorage holes in nose roller.

(a) If nose is uphill, move nose forward until center vertical is in front of nose roller. Put panel pin through nose roller and behind center vertical.


LAUNCHING NOSE HEAVY
PANEL PIN AND RETAINER CLIP
LAUNCHING NOSE ROLLER
POSITION OF CENTER VERTICAL WHEN NOSE IS UPHILL

(b) If nose is downhill, move nose to rear until center vertical is behind nose roller. Put panel pin through nose roller and in front of center vertical.

NOTE

Do not remove this pin until another nose section Is attached and the nose crew has hands on the nose to prevent It from rolling.

(12) Add further heavy launching noses as described in step (10). After each nose is added boom 10 ft forward and secure with panel pin as described in step (11).

(13) Continue until the launching nose is complete, then finally secure with panel pin through anchorage tube of next to last nose and nose roller.

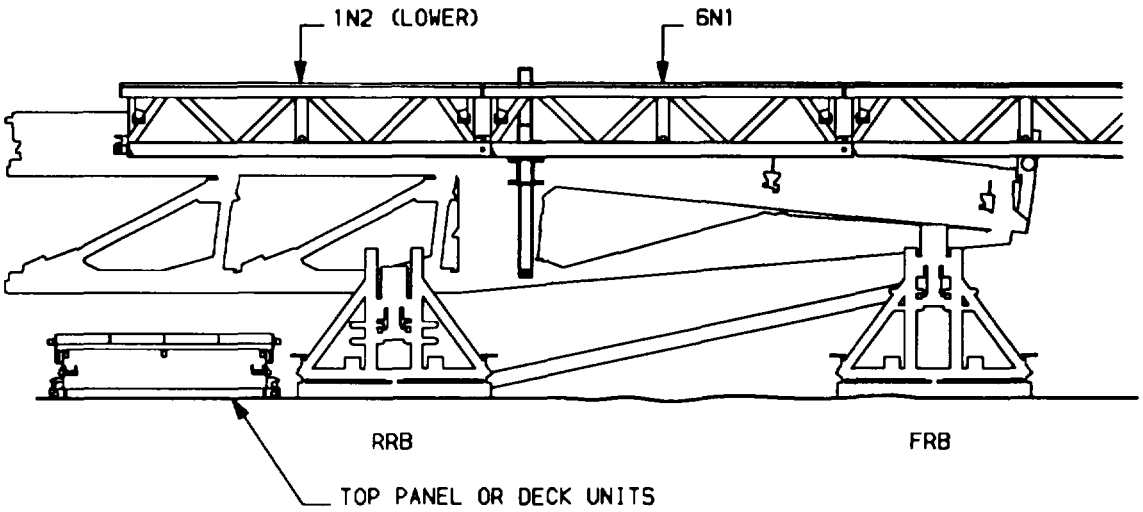
(14) Put retainer clip through end of panel pin.

c. Link Reinforced 2E + 18 thru 2E + 22 and Double Story w/o Link 2E + 19 thru 2E + 22

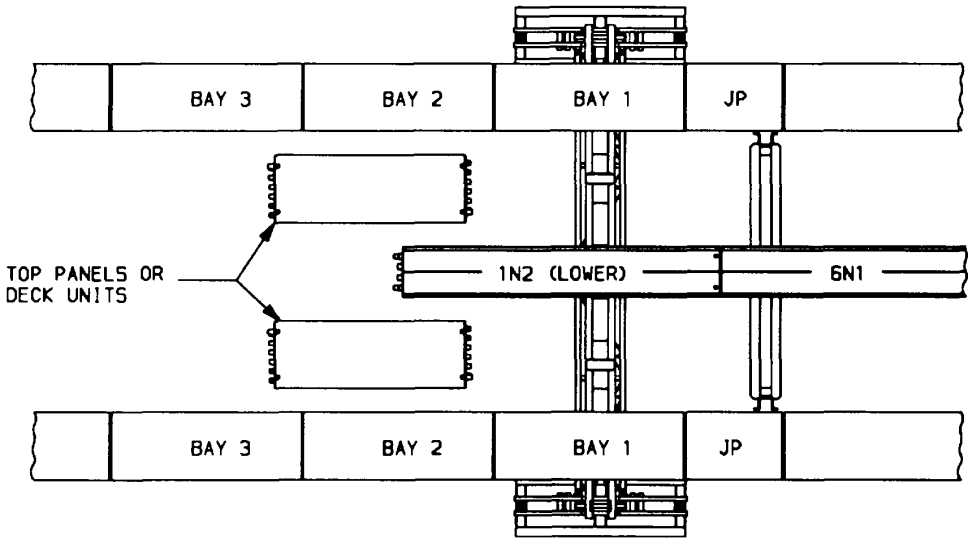
The launching nose configuration for these bridges is 6N1 + 3N2, which means the last three sections of heavy launching nose are double story. The drill for the double story section of the launching nose is as follows.

(1) Assemble the launching nose as normal up to 6N1, but place a landing roller pedestal Mk 2 and a 20 ton jack on the junction of the light nose front and light nose rear.

(2) Connect first lower double story nose section (1N2) to 6N1. DO NOT boom nose at this time.



(3) Place two top panels (or four deck units) on ground to each side of first nose section. Carrying crews will use these to step up on so they will be able to lift second nose section high enough.



(4) Put upper nose section (1 N2) of double story nose on top of first lower nose (1N2).

(5) Support nose, lift gravity catch, remove pin from anchorage tube and move nose forward until the vertical of sixth nose section is in front of holes in nose roller. Insert panel pin through holes in nose roller and allow nose to seat against this pin. DO NOT put the panel pin through the anchorage tube.

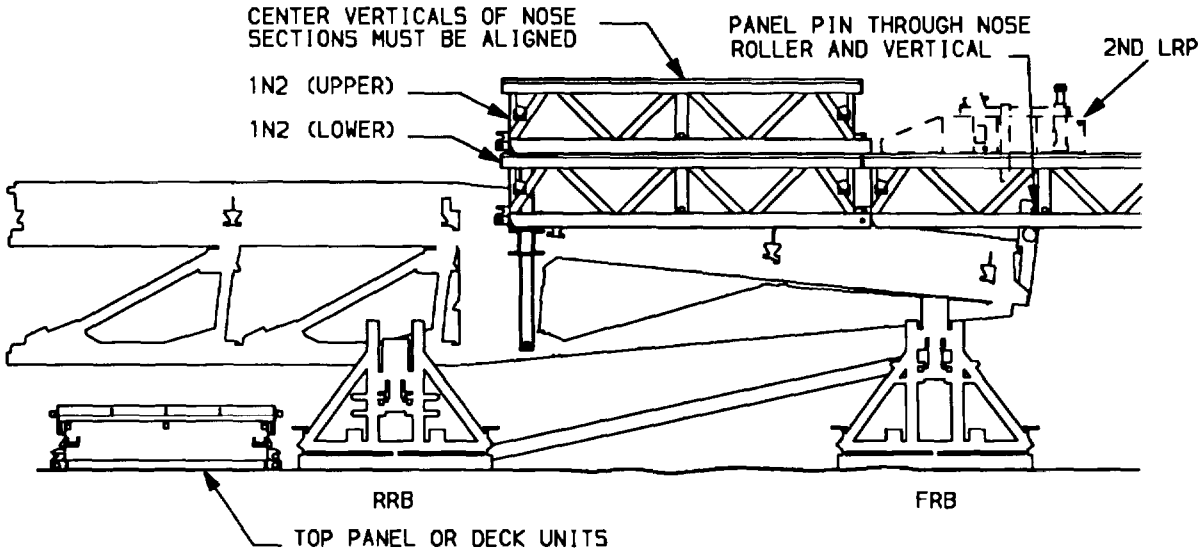
(6) If a second LRP Mk 2 is available, place it on heavy nose (6N1) at this time.

(a) Put one 20T jack (ram fully extended) in LRP, standing upright.

(b) Put two pieces of packing on LRP.

(c) Lift LRP onto one girder of bridge and slide along bankseat beam and lift onto nose.

(d) Secure LRP to nose with cargo tie-down strap.



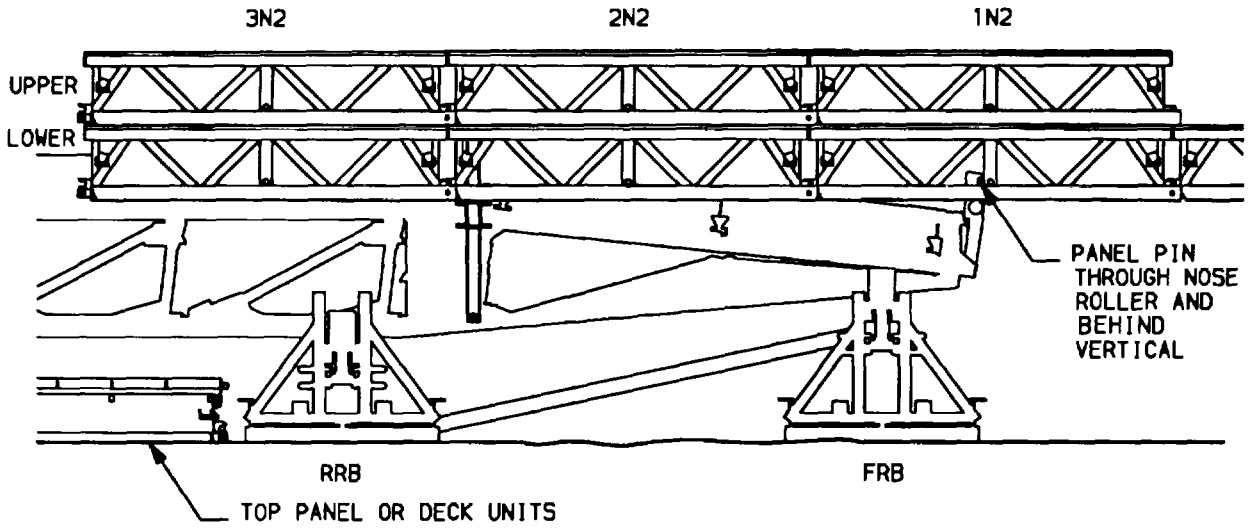
(7 Connect second lower nose section (2N2) to first lower nose section (1N2). DO NOT move nose at this time.

(8) Put upper nose section (2N2) of double story nose on top of lower nose section (2N2).

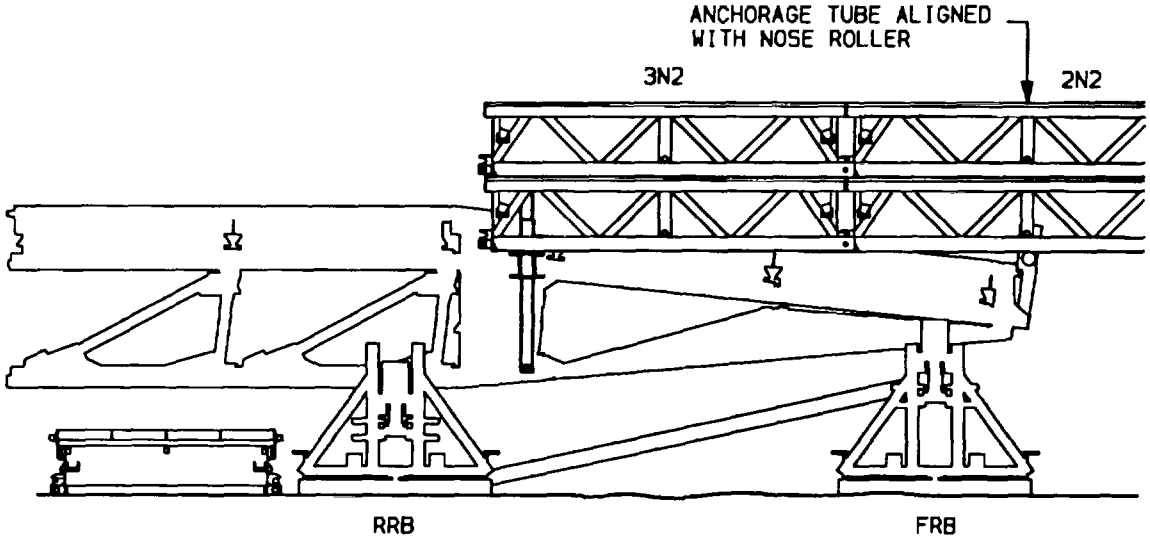
(9) Support nose, lift gravity catch, remove panel pin from nose roller and move nose forward until front vertical of first double story nose sections (1N2) is in front of holes in nose roller. Insert panel pin through holes in nose roller and allow nose to seat against this pin. DO NOT put pin through the anchorage tube.

(10) Connect third lower story nose section (3N2) to second lower nose section (2N2). DO NOT move nose at this time.

(11) Put upper nose section (3N2) of double story nose on top of lower nose section (3N2).



(12) Support nose, lift gravity catch, remove panel pin from nose roller and move nose forward until anchorage tube of lower nose section of 2N2 is aligned with holes in nose roller.



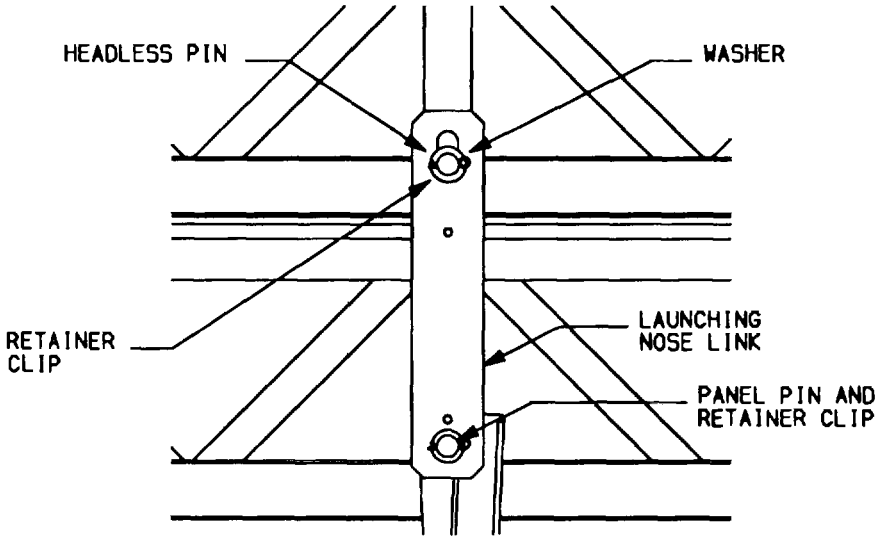
CAUTION

Center verticals of nose sections must be aligned. Failure to do so may result In damage to nose sections.

NOTE

Center crew will hold nose In this position until panel pin and first nose link is in place.

(13) Add nose links to each side of double story nose section (2N2).



(a) Put panel pin through round hole in link, then insert panel pin through hole in nose roller and anchorage tube of lower nose section.

(b) Ensure center verticals of upper and lower nose sections are in line.

(c) Insert headless pin through anchorage tube of upper nose section.

(d) Install flat washer over end of headless pin. Insert retainer clip in end of pin.

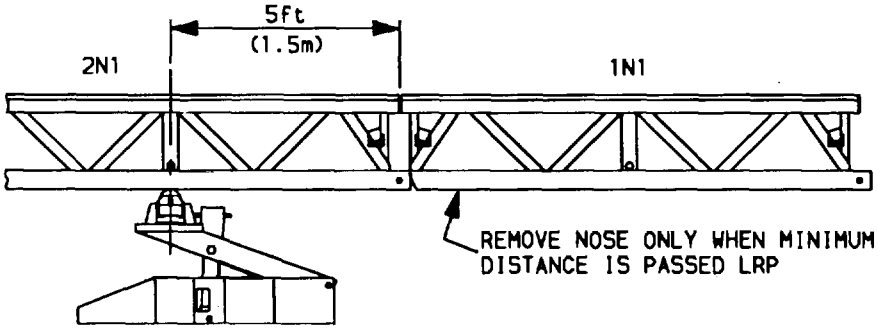
(e) Place other link on end of panel pin and headless pin on other side of launching nose.

(f) Install flat washer over end of headless pin. Insert retainer clips over ends of headless pin and panel pin.

4-13. STRIPPING LAUNCHING NOSE DURING LAUNCH

a. Bridges with a Single Story Nose.

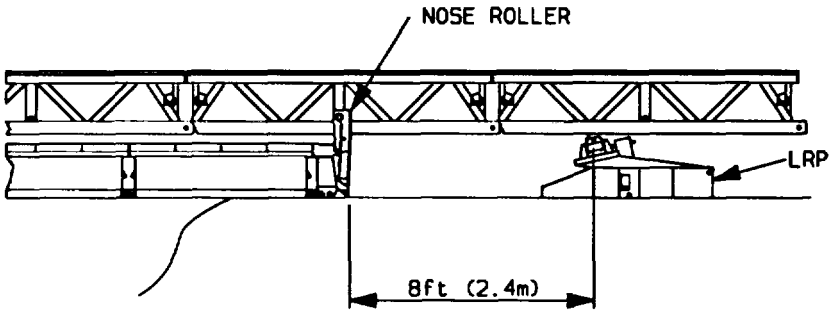
Nose sections (light and heavy) can be re moved during launch after they have passed the center of the landing roller. It is important to remember that at least 5 ft (1.5 m) of a nose section must extend beyond the landing roller at all times.



(1) Remove nose sections that have passed landing roller pedestal observing the 5ft (1.5m) minimum distance. Leave the last three nose sections in place. These will be removed after far bank end of bridge has been lowered to the ground.

(2) When far bank end of bridge has been lowered to ground, reposition landing roller pedestal so center of roller is 8 ft (2.4 m) from nose roller. This will enable last three nose sections to be removed.

(3) Raise landing roller pedestal until roller touches bottom of launching nose.



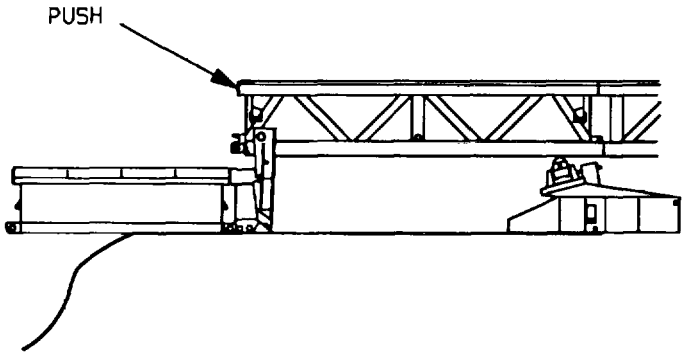
(4) Remove panel pin from nose roller and, with one person on launching nose cross girder to lift gravity catch, four personnel pull nose sections away from gap.

(5) Pull nose sections until junction of second and third nose sections is in front of the nose roller.

(6) Place panel pin through the nose roller behind the first vertical of the launching nose, then remove the first nose section.

(7) Remove the panel pin from the nose roller and pull the last two nose sections until the nose pin has passed the landing roller.

(8) Replace the panel pin through the nose roller and behind the last vertical of the launching nose. One person steady the last nose and push it against the pin while the second nose section is removed.



(9) Remove the panel pin and last nose section.

b. Bridges with a Double Story Nose.

These bridges have a double story launching nose configuration for the last three sections of nose.

(1) Remove all single story nose as normal.

(2) Remove retainer clips and washers from headless pin in nose link, then remove headless pin.

(3) Disconnect 1N2 upper from 2N2 upper and remove 1N2 upper.

(4) Disconnect 2N2 upper from 3N2 upper then remove both these nose sections.

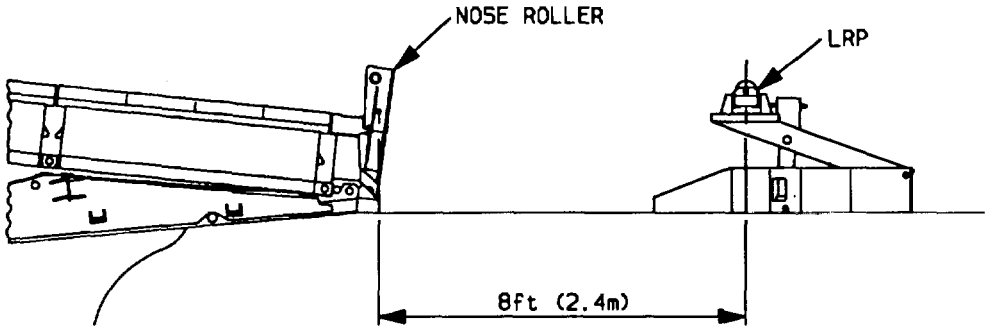
(5) Follow steps (6) to (9) in paragraph 4-13a.

4-14. ASSEMBLING LAUNCHING NOSES FOR DELAUNCH

a. Single Story 8 thru 12 Bay. Double Story 2E + 1 thru 2E + 22

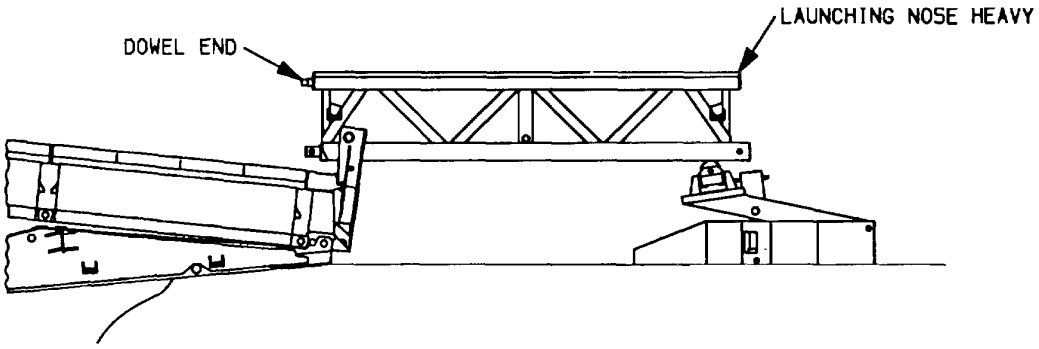
When the launching nose is to be assembled ready for delaunch, the launching nose, launching nose cross girder and posts will be fitted to the far bank end of bridge. In the procedure below, double story is illustrated, but the procedures are the same for 8 thru 12 bay single story.

(1) Place landing roller pedestal (LRP) 8 ft (2.4m) from bankseat beam. This distance is measured from nose roller to center of landing roller.



(2) Place partly raised [about 6 in (15 cm)] 15 ton jack in landing pedestal. Ensure jack is seated in base of landing roller pedestal and hood of landing roller pedestal is on head of jack correctly.

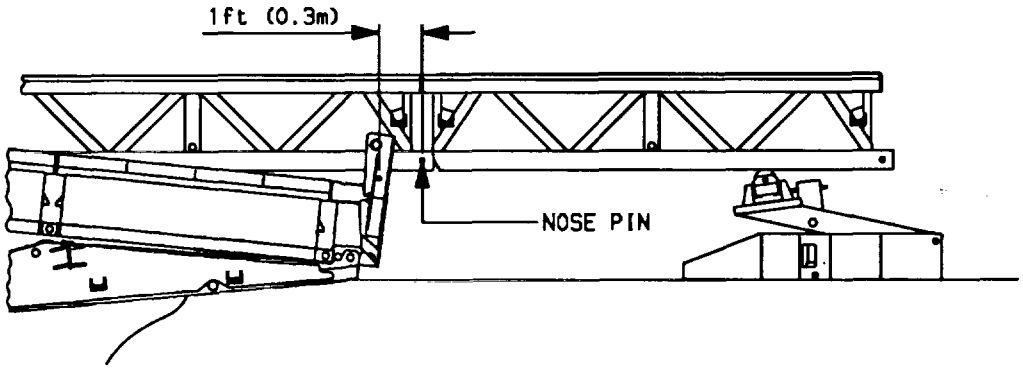
(3) Place first heavy nose section on nose roller and landing roller pedestal. Dowel end of nose unit faces cross girder. Place a panel pin through nose roller and nose section.



Support first nose section and add second heavy nose section.

(5) Remove panel pin from nose roller and move nose toward launching nose cross girder until nose pin is within 1 ft (0.3 m) of nose roller.

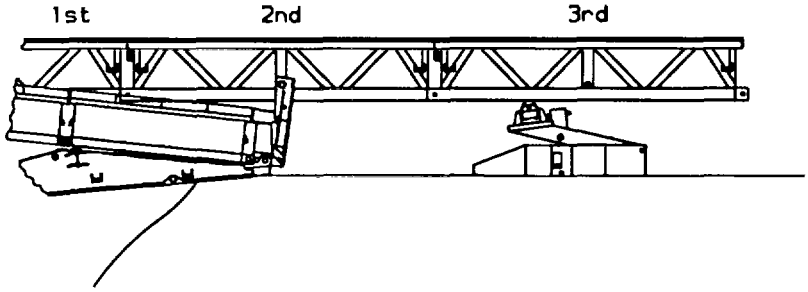
(6) Place panel pin through nose roller and nose section.



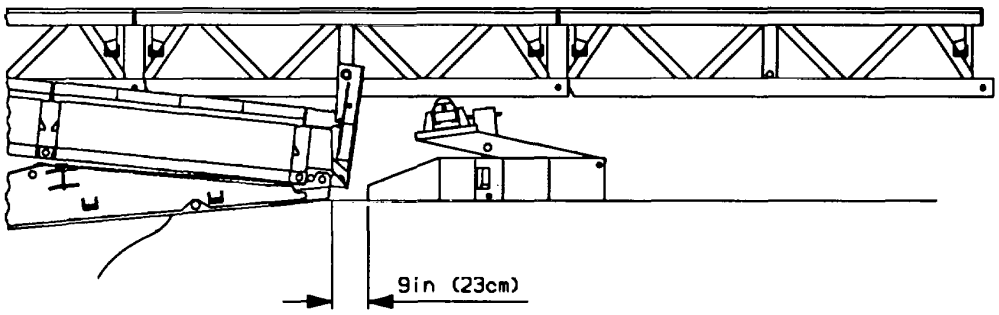
(7) Add third heavy nose section.

(8) Remove panel pin from nose roller and move nose toward launching nose cross girder. Nose has to be guided into rollers. Stop movement when anchorage tube of second heavy nose section is aligned with holes in nose roller.

(9) Place panel pin through nose roller and anchorage tube and secure with retainer clip.



(10) Move landing roller pedestal toward bankseat beam until base of landing roller pedestal is within 9 in (23 cm) of bankseat beam. Ensure landing roller pedestal is centered under launching nose.



(11) Add remaining heavy nose sections (including double story nose if required). Do not move launching nose into launching nose cross girder.

NOTE

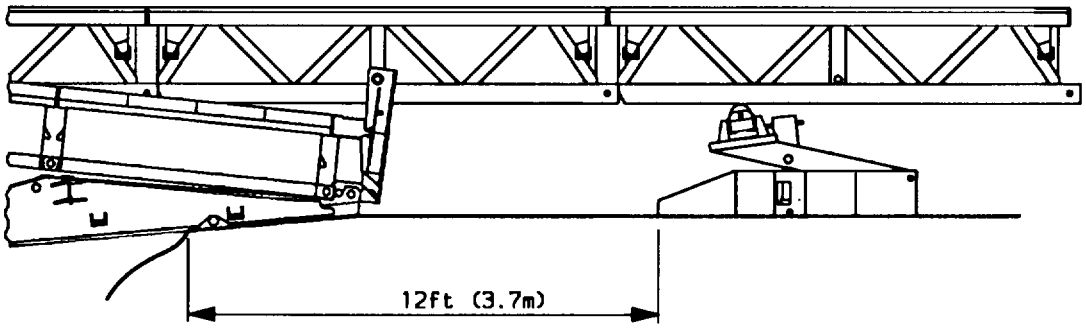
The remaining nose sections may be added during delaunch depending on site conditions. If noses are to be added during delaunch, always maintain minimum 5ft safety distance n front of LRP.

(12) Add light launching nose front and rear.

b. Link Reinforced Bridges.

(1) Perform steps (1) to (10) above.

(2) Move landing roller pedestal toward bankseat beam until base of landing roller pedestal is 12 ft (3.7 m) from A peg. Ensure landing roller pedestal is centered under launching nose.



(3) Add second story nose if required and as many nose sections (heavy and light) as possible. Do not move launching nose into launching nose cross girder.

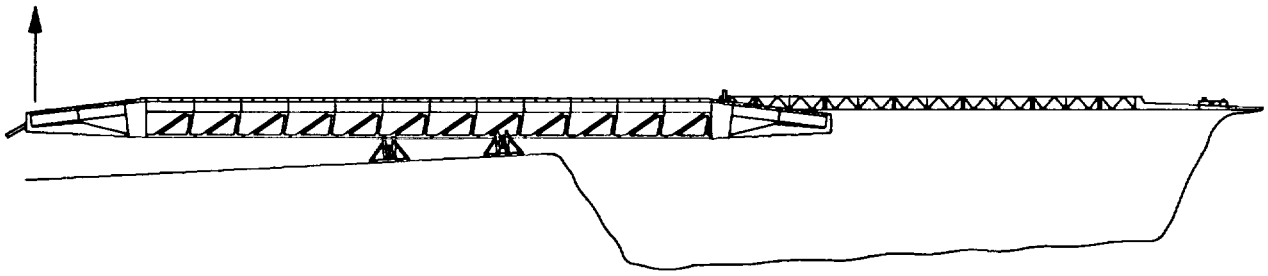
4-15. LANDING ROLLER PEDESTAL

When the landing roller pedestal is to be set up (para. 4-15a.) or recovered (para. 4-15c.), the bridge CG will be over the FRB (or CRB).The landing roller, landing roller pedestal, jack, jack handle and two pieces of timber packing are secured on the light launching nose with a cargo tie-down strap. The drill for setting up the landing roller pedestal follows, but care must be taken to ensure the stability of the landing roller pedestal in various conditions shown in paragraph 4-15b.

a. Setting Up Landing Roller Pedestal

(1) With CG over the FRB, raise rear end of bridge, under control, until nose touches far bank.

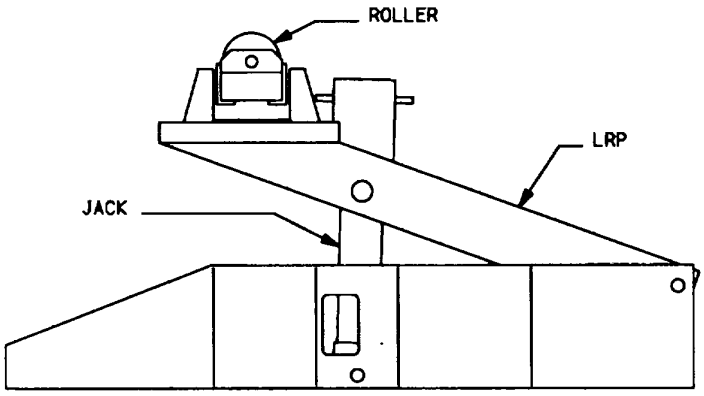
(2) Hold rear of bridge steady and far bank crew crosses to far bank with packing and carrying bars. Amount of packing is determined by NCOIC



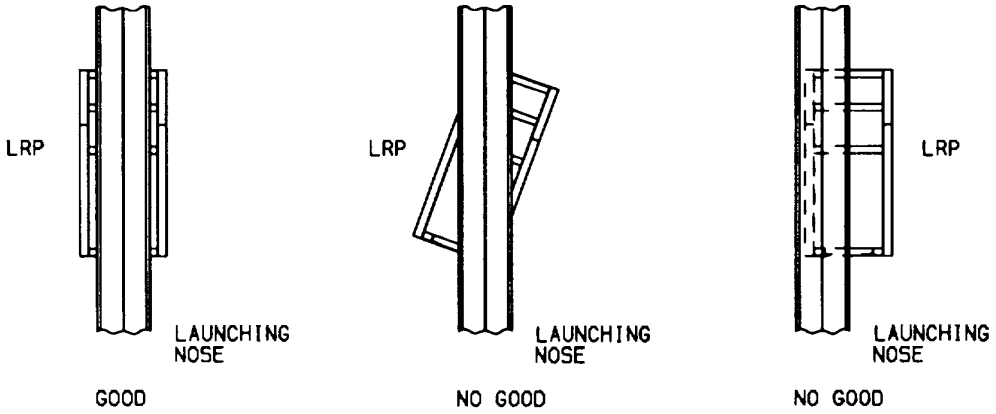
(3) Remove cargo tie-down strap.

(4) Remove landing roller pedestal from launching nose and when landing roller pedestal and personnel are clear, lower rear of bridge back onto building pedestals.

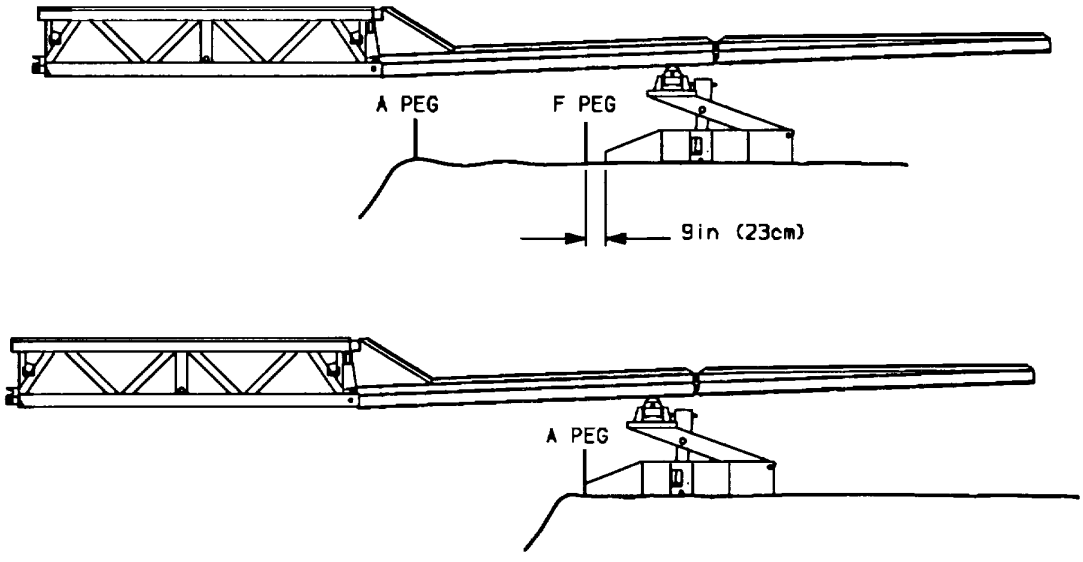
(5) Place fully extended jack on tilting platform in base of landing roller pedestal and lower jack hood onto head of jack. Place landing roller on landing roller pedestal with its baseplate under cleat.



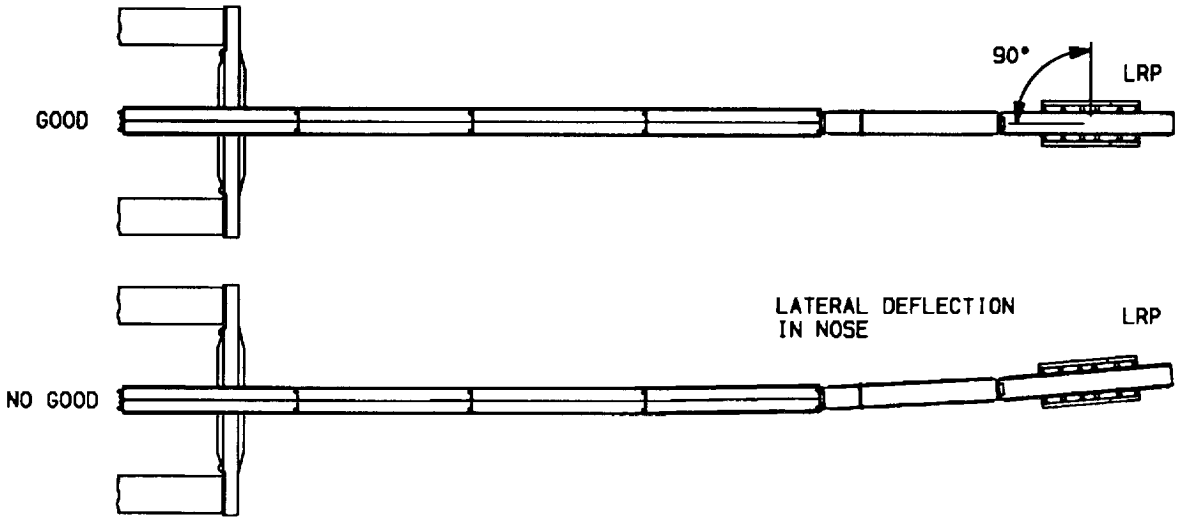
(6) Position landing roller pedestal with its base centered under and parallel to launching nose. Do not move nose sideways to fit landing roller pedestal.



(7) Position landing roller pedestal so that edge of landing roller pedestal is 9 in (23 cm) form F peg, or against the A peg for all link reinforced bridges.



(8) Raise rear of bridge and for single story bridges remove building pedestals. Check placement of landing roller pedestal to ensure that landing roller is at right angles (900) to nose, and that there is no lateral deflection in launching nose.



(9) With the panel point of launch over the FRB or CRB, check that the given landing zone (LZ) number or higher is over the center of the LRP rollers (para. 4-4).

NOTE

A landing zone number higher than the given LZ Is always permitted. Never use an LZ number lower than that given for the bridge being constructed.

(10) Far bank crew guides launching nose onto roller and will hold in place during the first 10 ft (3 m) of launch.

b. Stability of Landing Roller Pedestal

In the early stages of launching when vertical load on landing roller is small, the following action must be taken to reduce the risk of instability. In addition to the following, the far bank party should stand on uphill side of landing roller pedestal when there is a cross fall, or on the windward side if there is a strong wind, and steady the nose on the roller during the first 10 ft (3 m) of launch.

(1) If the far bank cross fall is greater than the allowable 10% (1 in 10):

Action - Level the ground locally or use packing

OR

Commence launch with landing roller pedestal partly lowered, raising it when the bridge has been launched 20 to 30 ft (6 to 9 m).

(2) If there is a side load from bridge launched in a cross fall:

Action - Set forward roller beam within 3 in (75 mm) of horizontal before nose is lowered onto landing roller pedestal.

(3) If there is a side load from bridge launched in wind speed over 30 mph (13.5 m/s):

Action - Provide tackles to restrain tail of bridge in early stages of launch.

(4) If there are very soft ground conditions:

Action - Use grillage stores under landing roller pedestal for packing.

c. Recover Landing Roller Pedestal

The procedure to recover the landing roller pedestal from the far bank during disassembly is described below. The bridge will have been de-launched until the CG is over the FRB or CRB and it is at this point the landing roller pedestal is to be recovered.

(1) Hold rear of bridge down on roller beams.

(2) Lower jack in landing roller pedestal. Remove landing roller pedestal from under launching nose and remove jack.

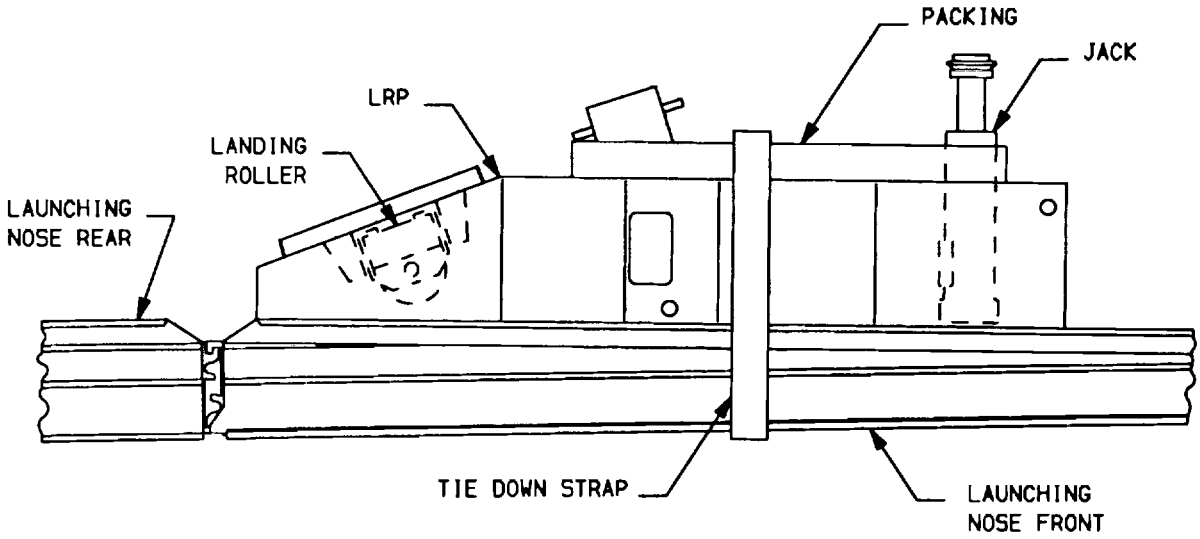
(3) Place jack and jack handle into closed landing roller pedestal.

(4) Raise rear of bridge to put tip of light launching nose on far bank.

(5) Place landing roller pedestal on to light launching nose front, with edge of LRP next to the junction of the light nose front and the light nose rear.

(6) Secure with cargo tie-down strap.

(7) Far bank crew returns to near bank.



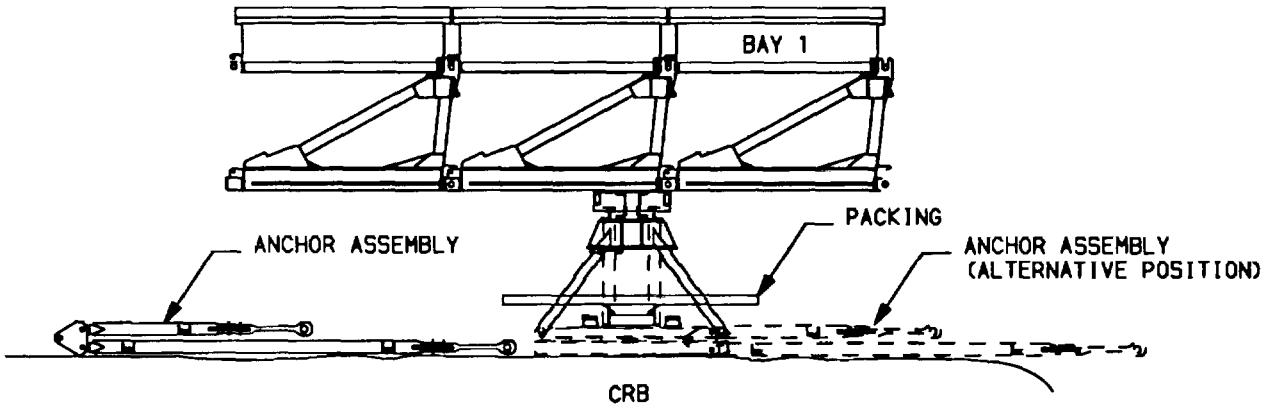
4-16. FITTING LINK COMPONENTS

When these components are ready for fitting the initial site layout is complete with the link components positioned ready for assembly to the bridge.

a. Fitting Anchor Assembly and First Link

When the anchor link is ready for fitting, the bridge is at 1 0p0 (over RRB). Therefore bay 1 is in front of the capsill roller beam.

(1) Position anchor assembly (AA) under bay 1 with anchor junction block facing away from gap.

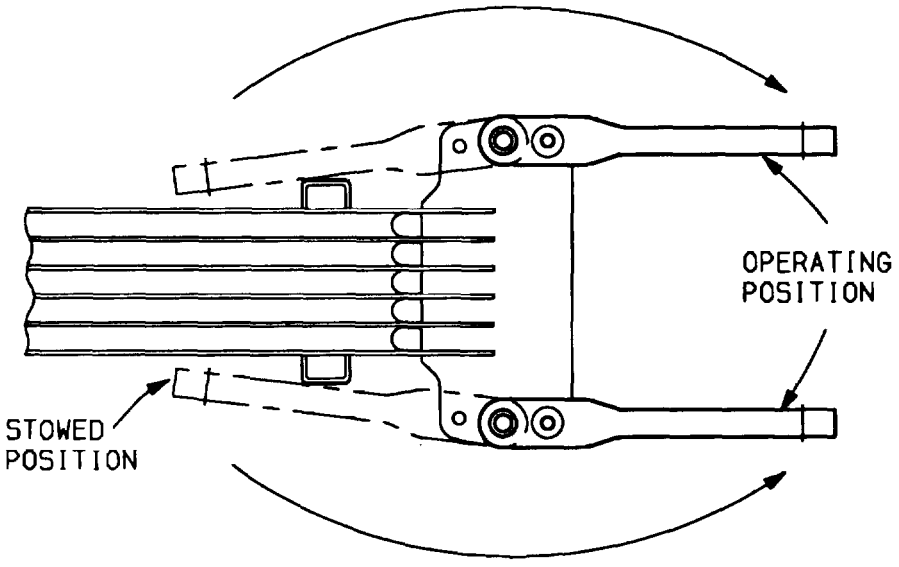


NOTE

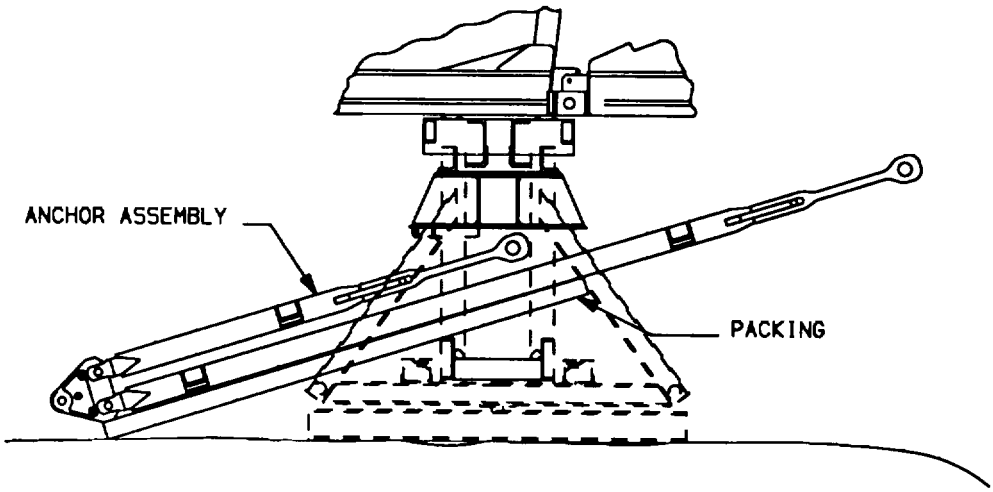
Lumber packing must be used under the anchor assembly to prevent fouling of assembly with the cross girder. It Is easier to place the packing after the assembly Is In place, than it Is before placing the assembly on the cross girder.

(2) Place a piece of packing on cross girder under anchor assembly. Size of packing to be used is: 3 in x 8 in x 84 in. This packing is used as a skid to prevent fouling of the anchor assembly on the cross girder, and will remain in position, either on the cross girder, or on the ground in front of the cross girder, while the remainder of the link is assembled.

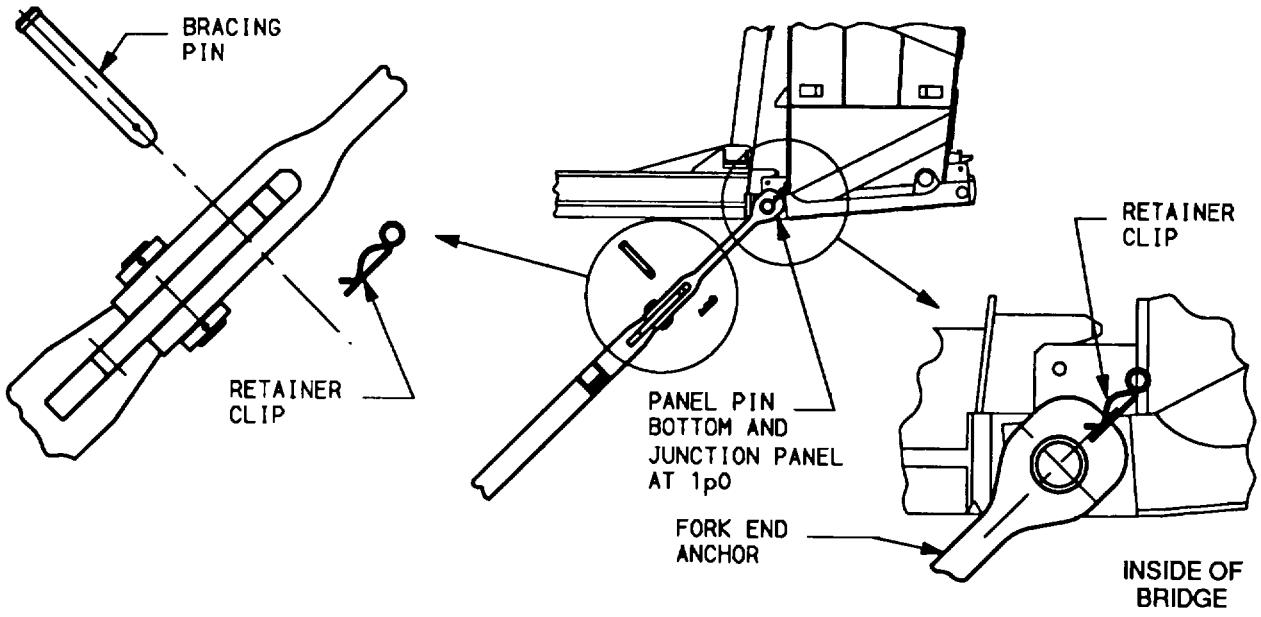
(3) Remove the retainer clip and bracing pin from the fork end anchor. Swing fork end anchors out to the operating position.



(4) The long link of the anchor assembly is positioned on the skid as shown below.



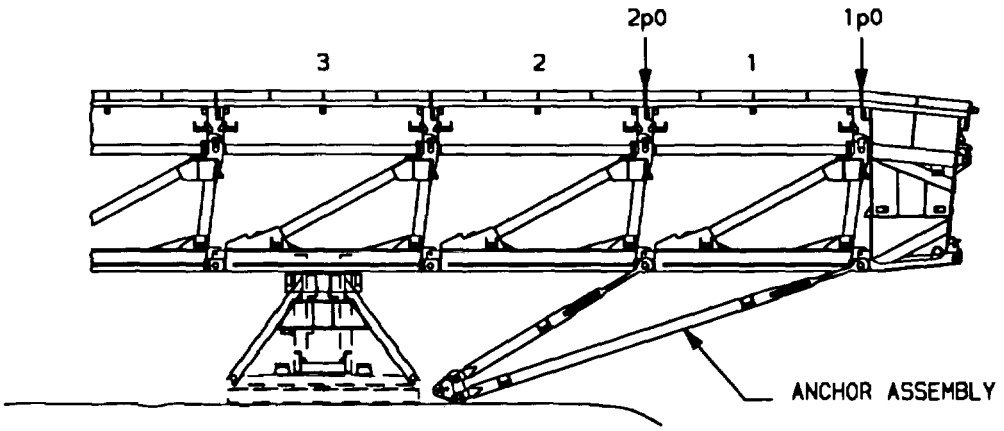
(5) Push anchor assembly forward and fit fork end anchors of the long link over bottom panel pin at panel point 1p0. The retainer clip through the panel pin must be removed, and then replaced once the end anchor is in place. Note the fork ends have elongated holes for easy connection.



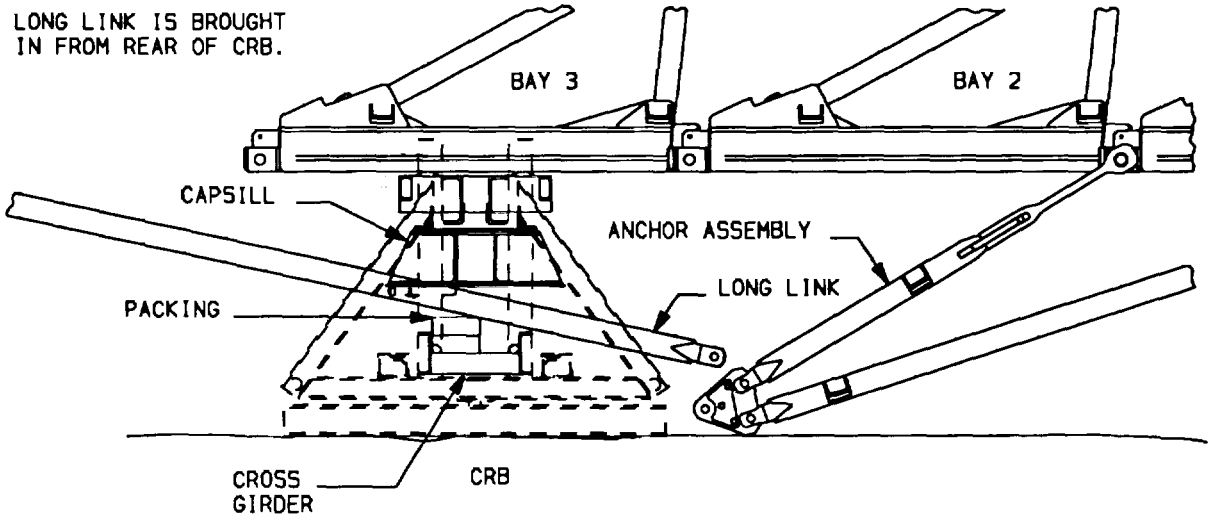
(6) Lock the fork end anchors in operating position with bracing pin and put retainer clip through the end of bracing pin.

(7) Boom bridge to 11 p0 over rear roller beam. Lock rollers.

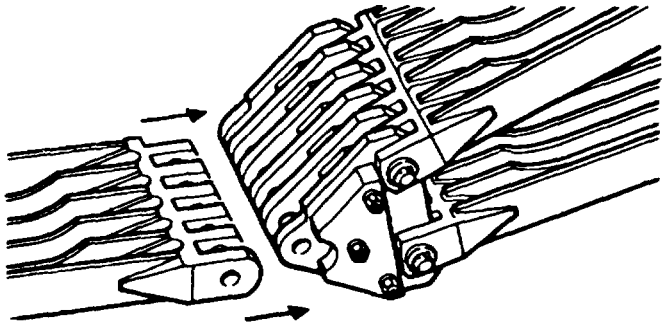
(8) Connect the fork end anchors of the short link to the bottom panel pin at panel point 2p0, as described in steps (4), (5) and (6).



(9) To connect long reinforcing link to junction block of anchor assembly, the long link is brought in behind the capsill roller beam and positioned under the roller beam and over the cross girder and the two pieces of packing (3 in x 8 in x 36 in).



(10) Align pin holes of link with holes of anchor junction block. Use male and female guides to align pin jaws.



(11) Insert nose pin through holes in link and anchor junction block. Put retainer clip through end of nose pin.

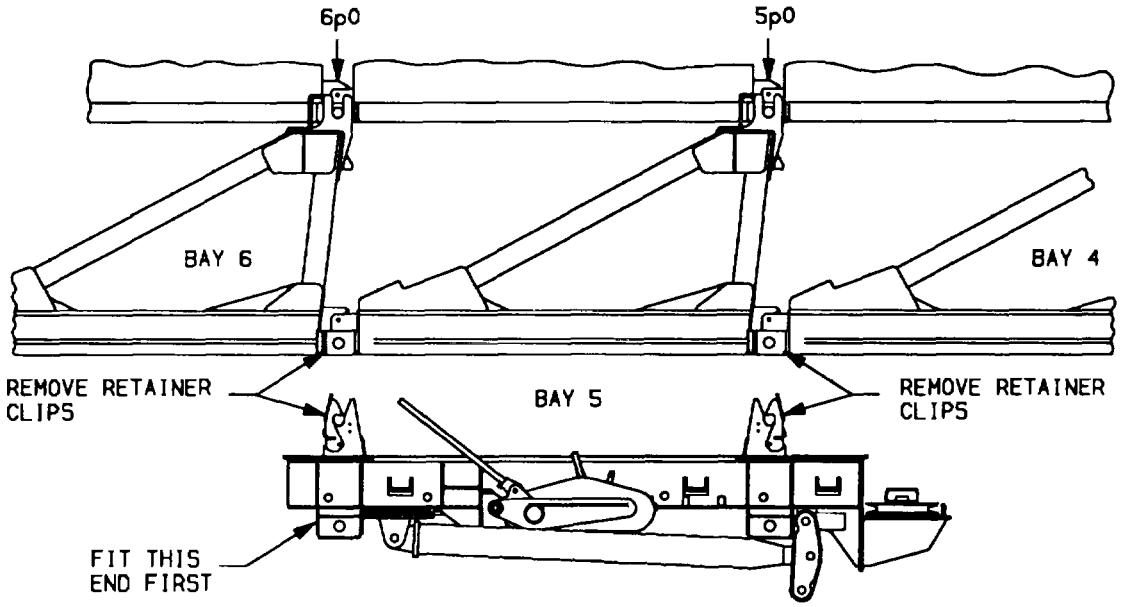
b. Fitting Post Tensioning Assembly, Footwalk and Second Link

Post tensioning assemblies can be right or left handed. Ensure that correct assembly is used. Pulley end of assembly must be toward closest bankseat beam with cable puller rigged on outside of bridge. The drill for fitting the first post tensioning assembly at bay 5 is described below.

(1) Position post tensioning assembly under bay 5 which will be positioned in front of the capsill roller beam.

(2) Remove retainer clips from upper jaws of post tensioning assembly, these clips will be put back in when jaws lock around panel pins.

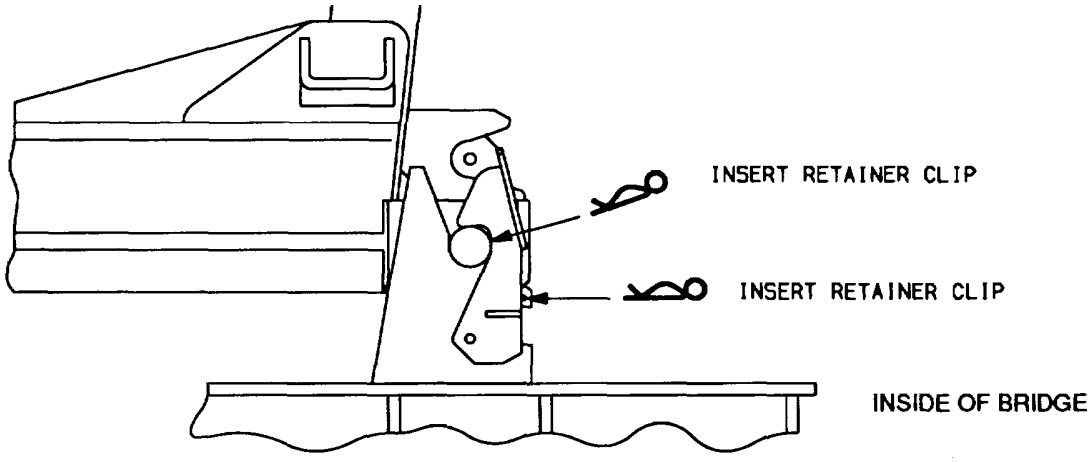
(3) Remove retainer clips from panel pins at 5p0 and 6p0 (bottom panel pins). These clips will be put back in after upper jaws are secured to panel pins.



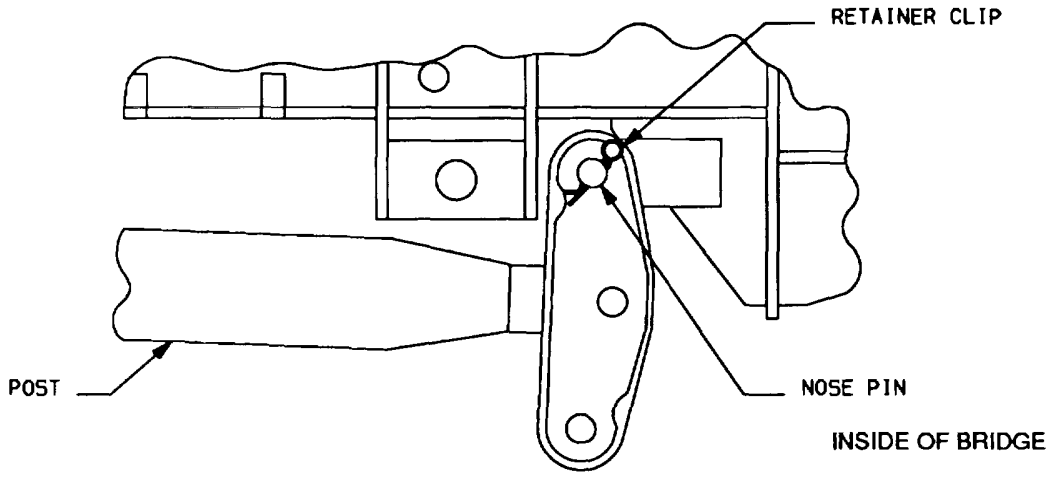
NOTE

Ensure that bottom panel pins are fully seated. If not, shoulder of pin will Interfere with connection of post tensioning assembly. These pins must have been checked when bay 5 and 6 were added and the same procedure will be carried out five bays from the near end of bridge.

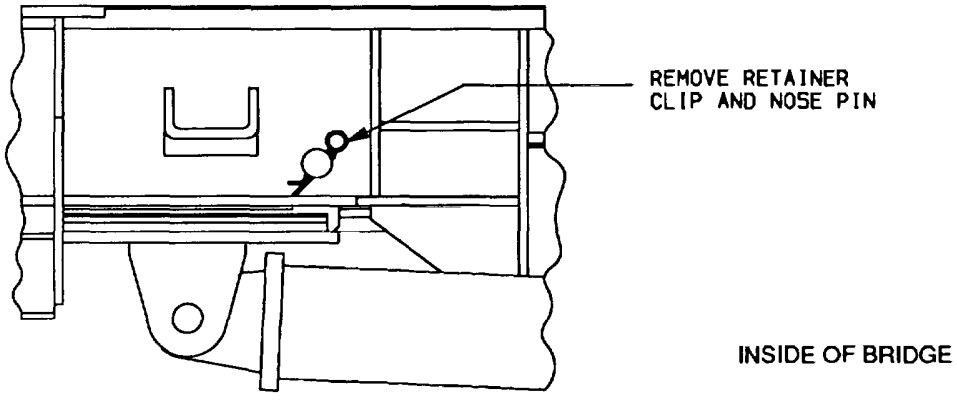
(4) Lift post tensioning assembly until upper jaws engage and lock around ends of panel pins in bottom panel. To ease operation, engage jaws one end at a time, fitting at 6p0 first and 5p0 second. Put retainer clip back in each upper jaw and each bottom panel pin.



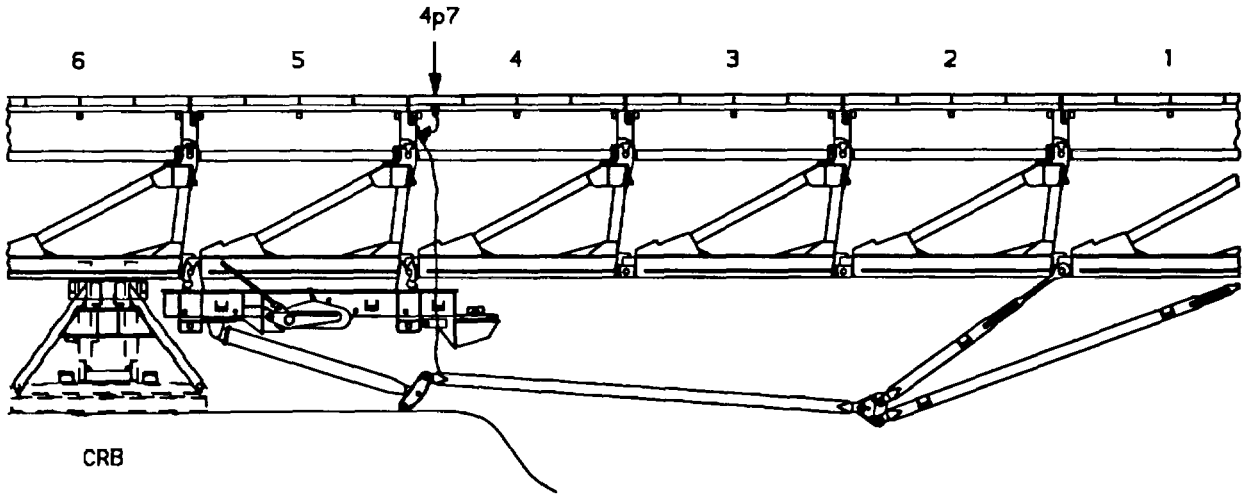
(5) Remove retainer clip from the nose pin holding the post to the frame. Push upwards on the post to enable the nose pin to be removed, then lower the post. This nose pin will be used to connect the anchor assembly long link to the post [step (7)].

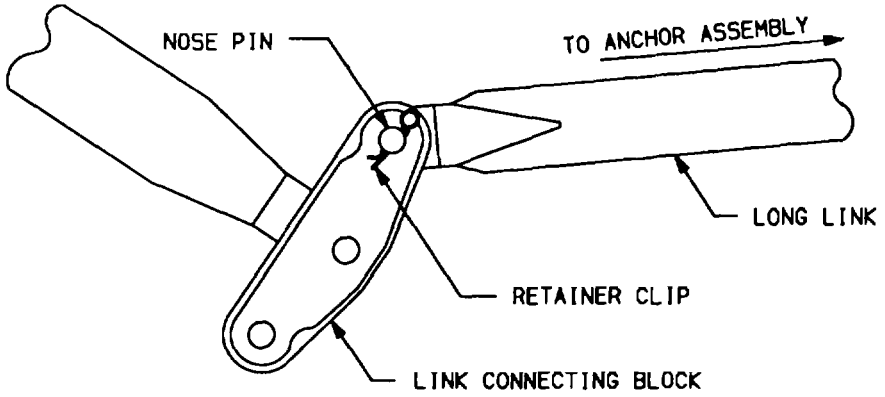


(6) Remove retainer clip and nose pin securing sliding block in frame. Use this pin to secure block once post has been tensioned. Until needed this pin is stored in bottom panel of bay 5. Place puller handle in bottom panel of bay 5.

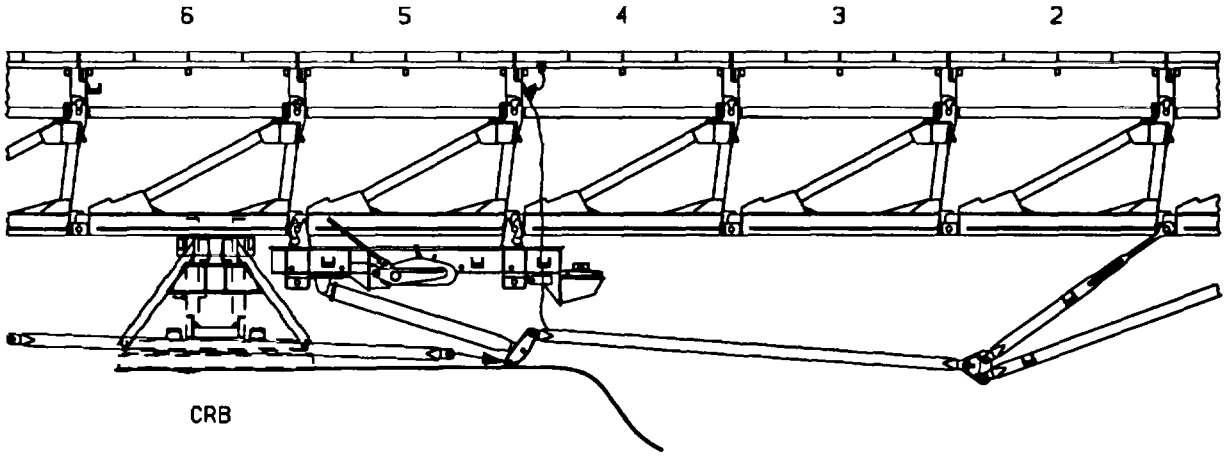


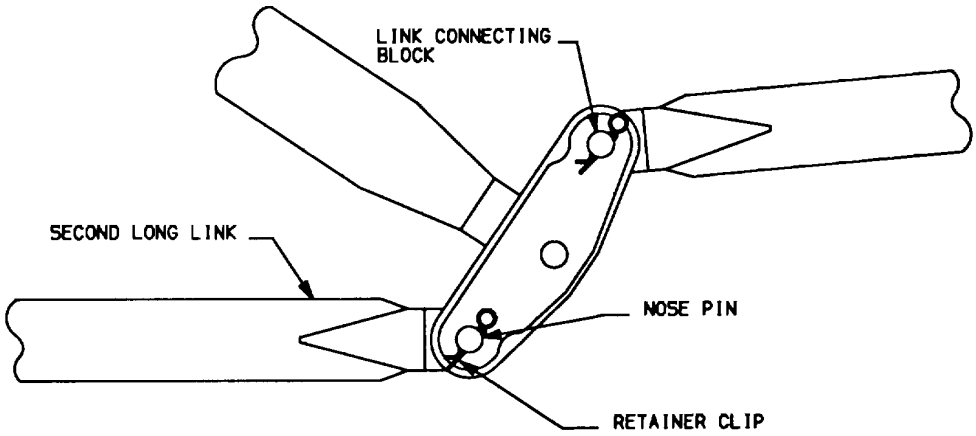
(7) Connect long link from anchor assembly to link connecting block with the nose pin removed at step (5). Secure with retainer clip.



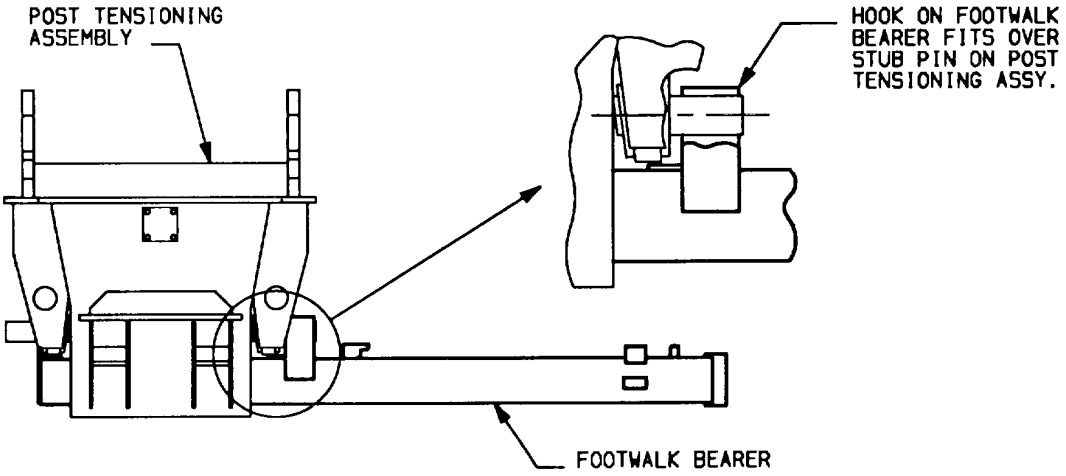


(8) Timber packing (3 in x 8 in x 84 in), previously on cross girder, will now be positioned on the ground in line with the bridge girder, to act as a skid and assist in assembling of links. Connect second long link to post tensioning assembly link connecting block with nose pin. Secure with retainer clip. Feed the link under the roller beam cross girder unless site conditions determine it must be fed between the cross girder and roller beam.

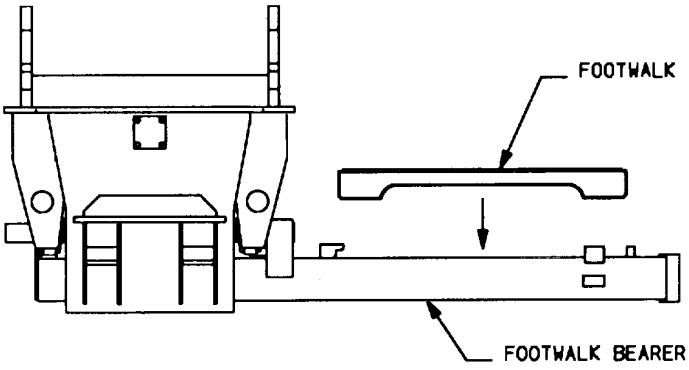




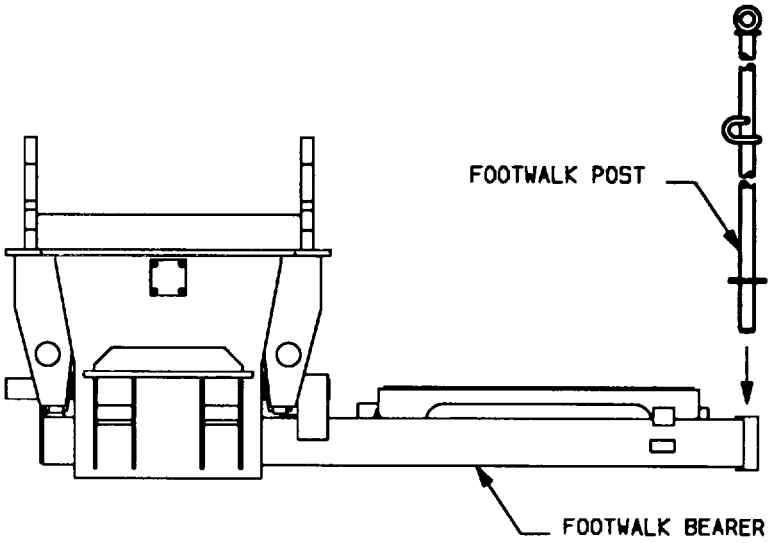
(9) Fit footwalk bearers to stub pins on post tensioning assembly. Ensure that post tensioner puller cable is above footwalk bearer.



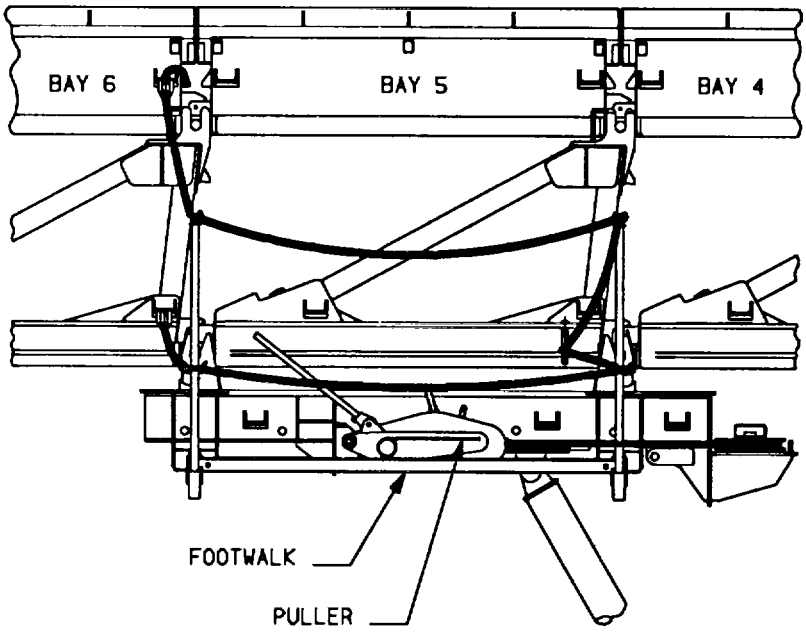
(10) Place footwalk on bearers. Ensure that footwalk is fully seated on bearer.



(11) Put footwalk posts in holes of footwalk bearers.



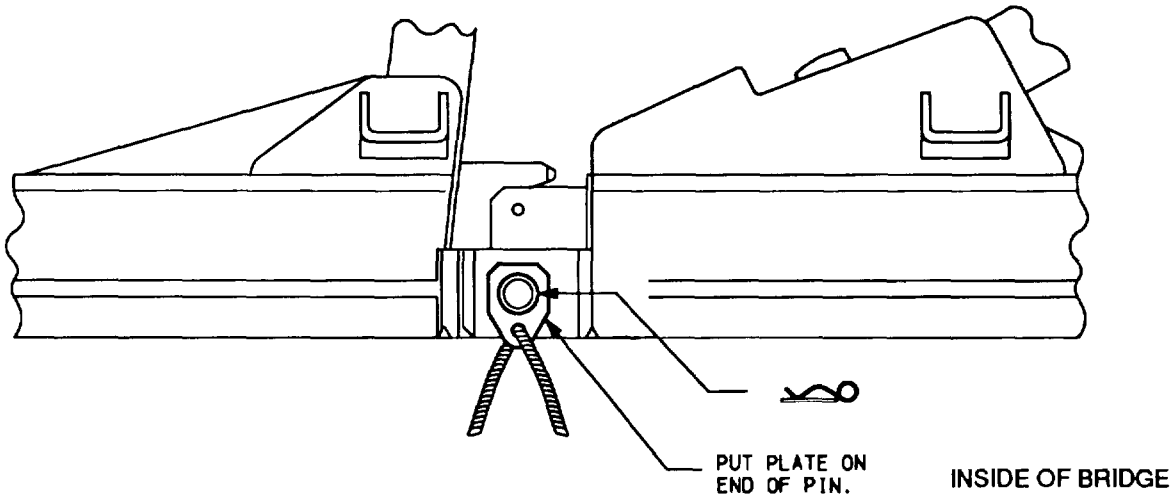
(12) Put hook of guard rope in carrying bar bracket of bay 6 bottom panel. Feed rope through bottom hooks of both posts. Form a bight in rope at sway brace bracket of bottom panel 5 and secure bight in bracket with bracing pin. Feed rope through top hooks of posts. Put hook of guard rope in carrying bar bracket of bay 6 top panel. The high side of the rope should be behind the operator when operating the post tensioner puller, therefore the high side of the rope will always be toward the center of the bridge.



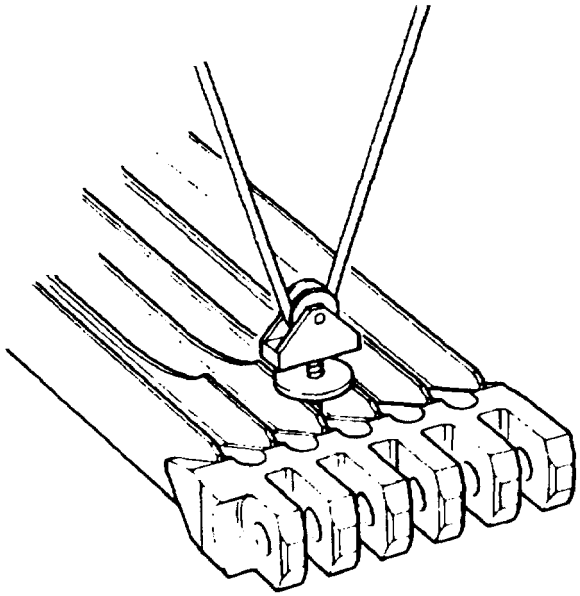
c. Fitting Light Tackle

Light tackle is used to support the link as a slack chain at all link joints during building and booming, then to lower the link to its final position. It has two hooks. The hook closest to the end of the rope is the low position hook which is used when the link is in its final (low) position. The other hook is the high position hook which is used to hold the link in it's high position during building and booming.

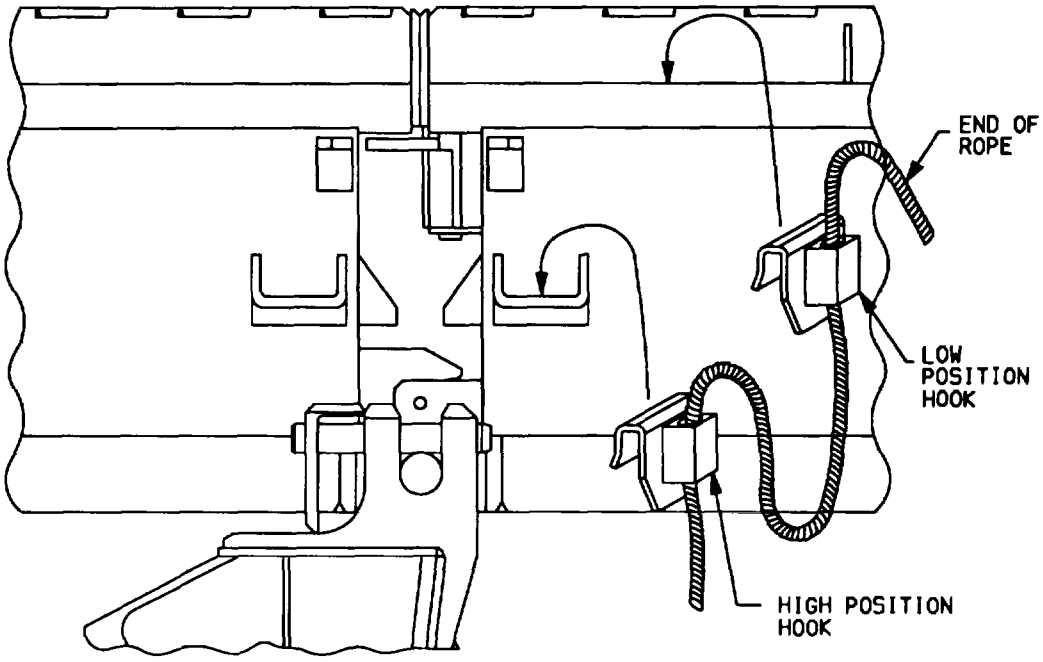
(1) Remove retainer clip from panel pin in bottom panel and fit plate of light tackle over end of pin. Put retainer clip back in end of panel pin.



(2) Place toggle bar in center hole of link, push down and turn through 90° (1/4 turn) to lock toggle bar in link. Ensure there are no snags or knots in the rope running around the pulley.



(3) Place high position hook in carrying bar bracket of top panel and low position hook in deck rail of top panel. This will hold the link in the high position during building and booming.

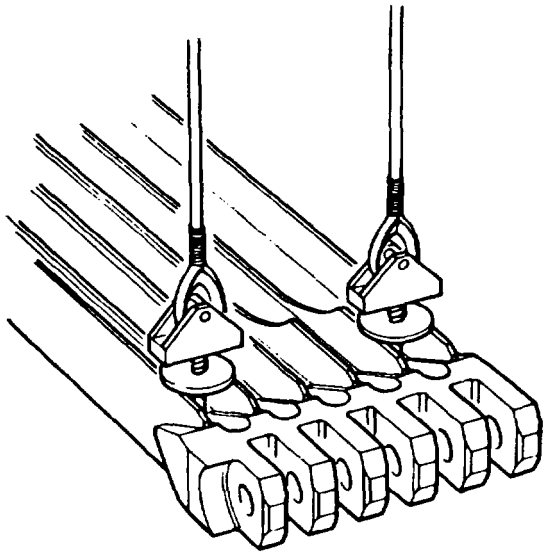


(4) When the link is to be lowered to its "low" position, personnel are standing along one girder, two at each light tackle. All the personnel in unison lift the link to disengage the high position hook, then lower the link and place the low position hook in the carrying bar bracket. The link is now ready for tensioning.

d. Fitting Anti Flutter Tackle

Two Anti-Flutter tackle are connected to each link girder as close to the mid-point of the bridge as possible.

(1) Place one toggle bar into each outer hole in reinforcing link. Push down and turn through 900 (1/4 turn) to lock toggle bar in link.



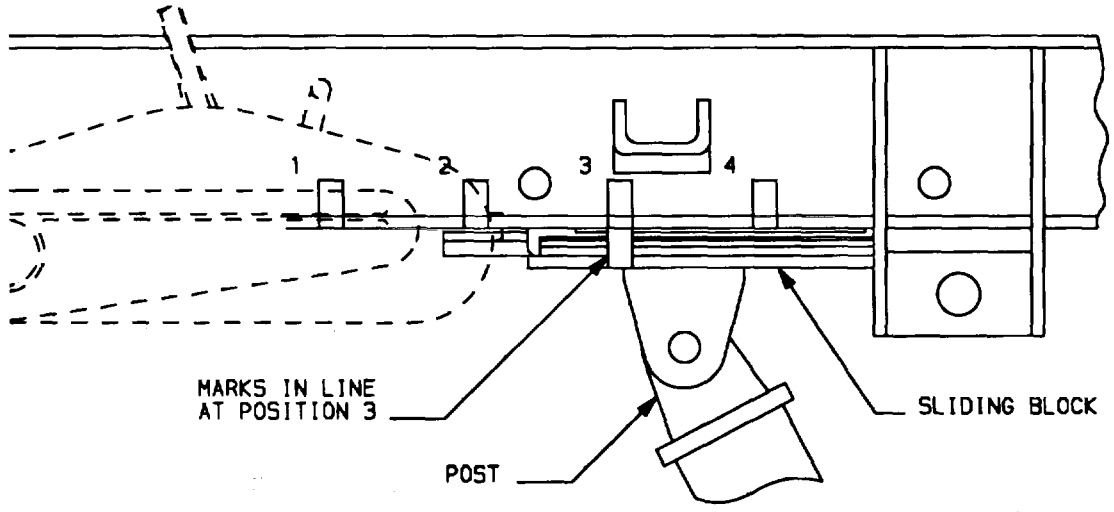
(2) Connect the hooks of the anti-flutter tackle to the carrying bar brackets of the top panel, one on the outside of bridge, the other on the inner.

(3) Ensure ropes are kept free of any adjacent light tackle.

(4) The anti-flutter tackle is automatically tensioned when the link is lowered and post tensioning posts are in their final position.

e. Tensioning

The post tensioning assembly tensions the link using pullers (para. 4-17). When tensioning the link, the check marks on the post tensioning frame and slide block are used to ensure equal loading on all four pullers. If necessary, one bridge girder at a time can be tensioned. For convenience, during the build, the puller handles should have been placed in the well of the bottom panel holding the post tensioner.



(1) All puller operators start together at mark I and proceed until mark 2 is reached.

(2) All operators proceed to mark 3 and check.

(30 Finally proceed to mark 4 and insert launching nose pin through hole. Secure with retainer clip.

(4) Operate pullers to slacken puller cables to transfer the load off the cables and onto the pin, then place handle in well of bottom panel for later use.

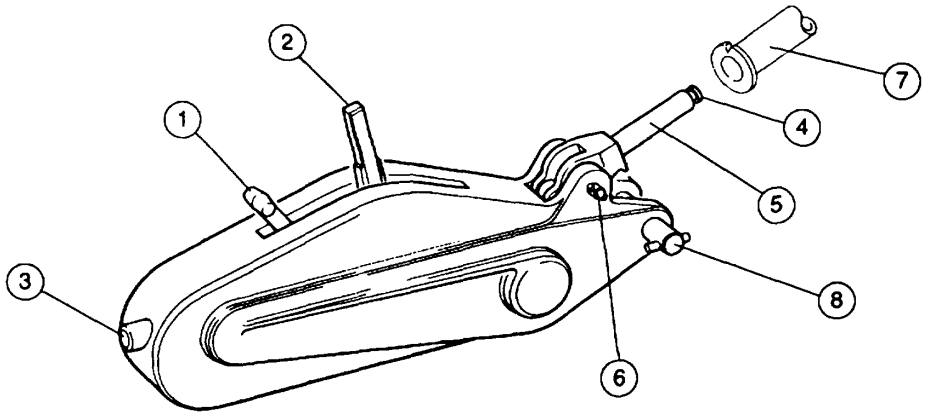
4-17 OPERATION OF PULLER

The puller is used with the jacking bracket and davits to raise or lower the bridge. It is also used on the post tensioning assembly to apply or release tension in the link chain. The puller is operated using a telescopic handle [para. 1-9c. step (17)]

a. Threading Cable Into Puller and Taking Up Slack

(1) Uncoil cable into a straight line to prevent loops which might untwist the strands or form kinks when under tension.

(2) Open the jaw clamp (1) by pushing it towards lever (2) using the heel of the hand. A definite "click" 4-63 can be heard when the jaws are properly opened.



(3) Feed the cable through hole (3) until it emerges from the other side of the puller and continue until desired length is reached.

(4) If, during operation, a considerable length of slack has to be taken up before the puller takes the load, open the jaws by the method described in step (2) and pull the slack through by hand.

b. Preparing Puller to Take Load

If the jaws have been opened they must be re engaged before the puller can take load. This is achieved by giving the jaw clamp (1) a sharp downward and forward blow with the palm of the hand, away from lever (2). It will engage with a definite "click".

c. Selecting Speed

NOTE

Because four pullers are used in unison when tensioning the link It is Important that all four are set in the same gear. Therefore always use low gear In any bridging operation. It should be a general rule that pullers are kept in low gear and only rarely set at high. If high speed Is used, it should be returned to low after use.

(1) Raise the gear change plunger (4) on top of lever (5).

(2) Rotate the gear change control (6) until the indicator points to high or low.

d. Taking In

(1) Place the handle (7) over lever (5).

(2) Make full definite strokes backwards and forwards of the handle. The cable will move with each backward and forward stroke. Do not be tempted to make small strokes as the jaws inside the machine will fail to operate correctly.

e. Paying Out

(1) Place the handle (7) over lever (2).

(2) Make full definate strokes as in step d.(2) above. There is no extra control to be operated to obtain reverse.

f. Anchoring the Puller

The puller should only be attached to an anchorage, post tensioner, jacking bracket and davits, using the pin and clip (8).

4-18. LAUNCHING BY VEHICLE

BOOMING is movement of the bridge until the panel point given is over the RB (for SS) or RRB (for DS). Booming of double story bridges by manpower alone is allowed until 9 bays have been assembled. At 9 bays, the weight of the bridge has reached a point where booming by vehicle is required. The rule to follow is:

single story - 9 bays or more, boom by vehicle

double story - 9 bays or more, boom by vehicle

LAUNCHING is movement of the bridge until the panel point given is over the RB, FRB, or CRB.

WARNING

Death or personal Injury can result If the bridge Is launched by hand. A launch vehicle is required to prevent the bridge accelerating out of control. When a bridge Is to be launched or delaunched, a vehicle must be used at all times.

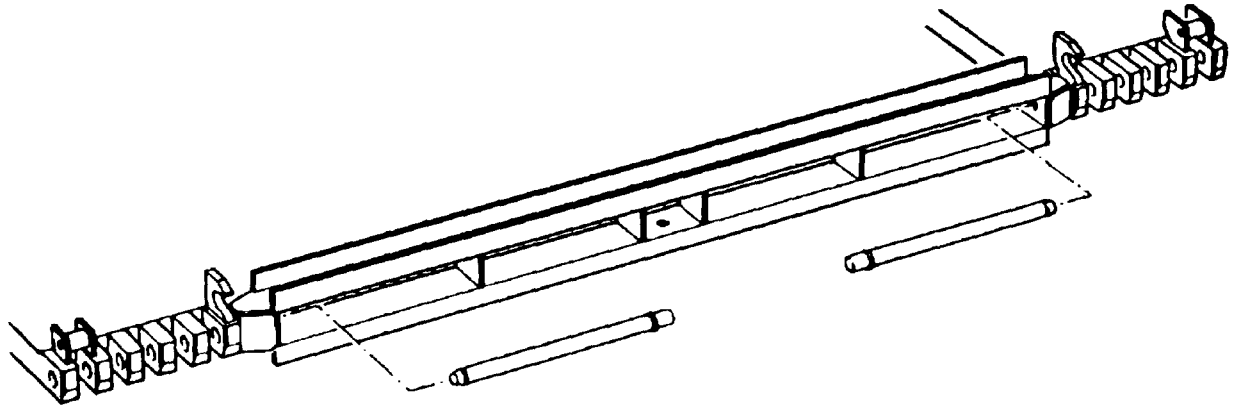
When a bridge is to be launched/delaunched, a vehicle and push bar are used. Use a long push bar for all link reinforced bridges and double story bridges over 13 bays long. Its greater length is needed during final launch to avoid excessive steep angles between bankseat beam and push bar.

a. Connecting Push Bar Cross Girder to Panel

(1) Hold push bar cross girder to pin jaws of bottom panel (DS) or top panel (SS).

(2) Insert panel pins in girder from inside of girder, and push until pins are fully seated in jaws of bottom panel.

(3) Do not put retainer clip through panel pins.

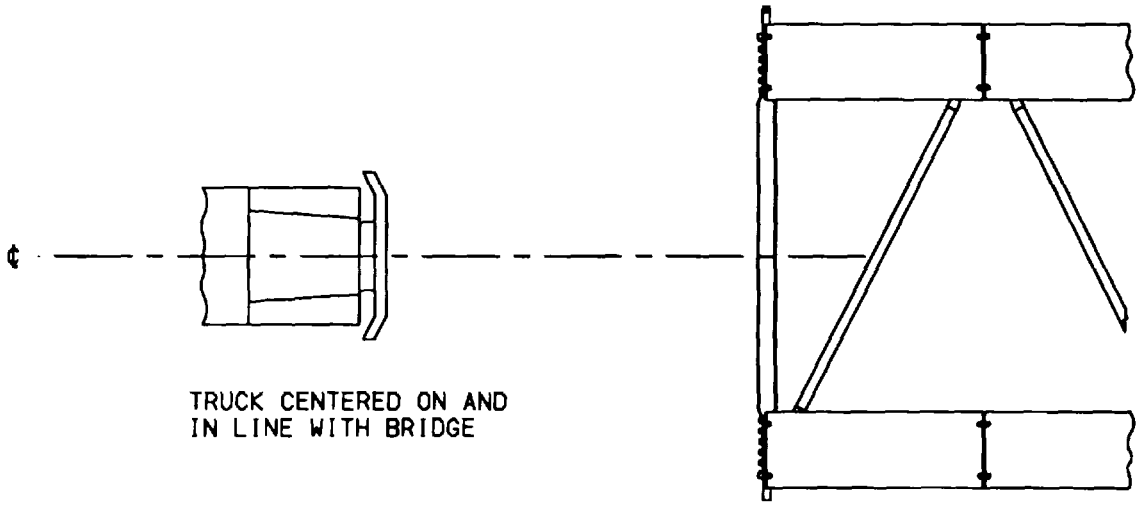


b. Connecting Push Bar Adapter and Push Bar

(1) Move vehicle into position at rear of bridge.

(2) Front of vehicle should be about 20 ft (6.1 m) from rear of bridge.

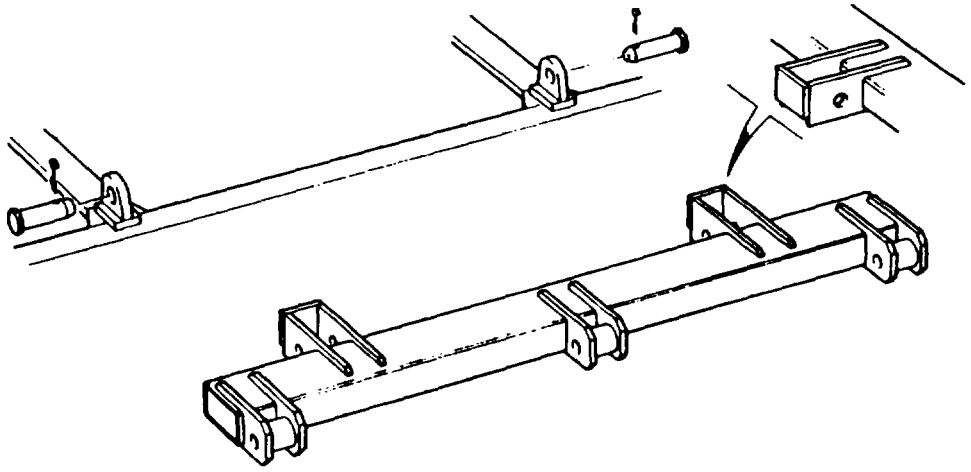
(3) Ensure that vehicle is centered and straight with bridge.



(7) Position adapter on towing lugs of vehicle bumper; holes of adapter align with holes in lugs.

(8) Insert bracing pins through adapter and lugs.

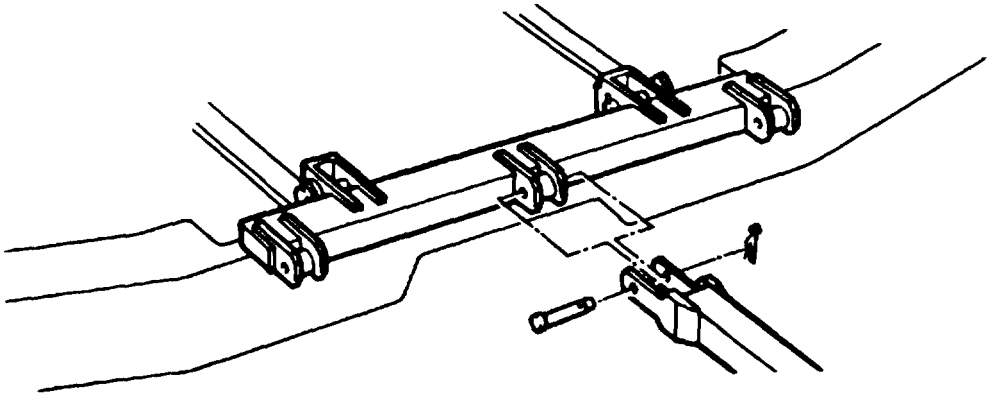
(9) Put retainer clips through the end of bracing pins.



(7) Align holes in fixed end of push bar with hole in center bracket of adapter.

(8) Insert bracing pin in push bar and bracket.

(9) Put retainer clip through the end of bracing pin.

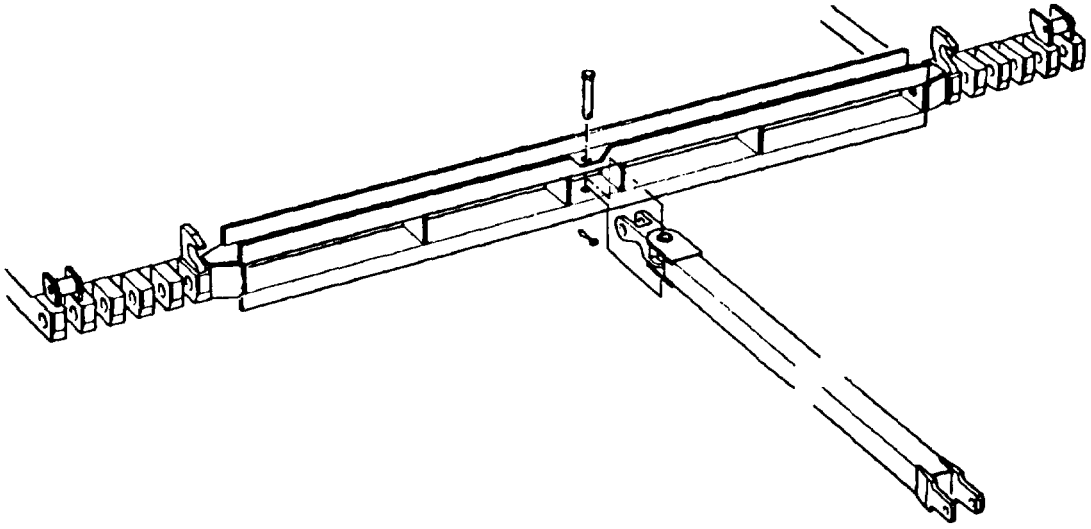


(10) Move vehicle toward bridge slowly.

(11) Guide end of push bar into opening of cross girder.

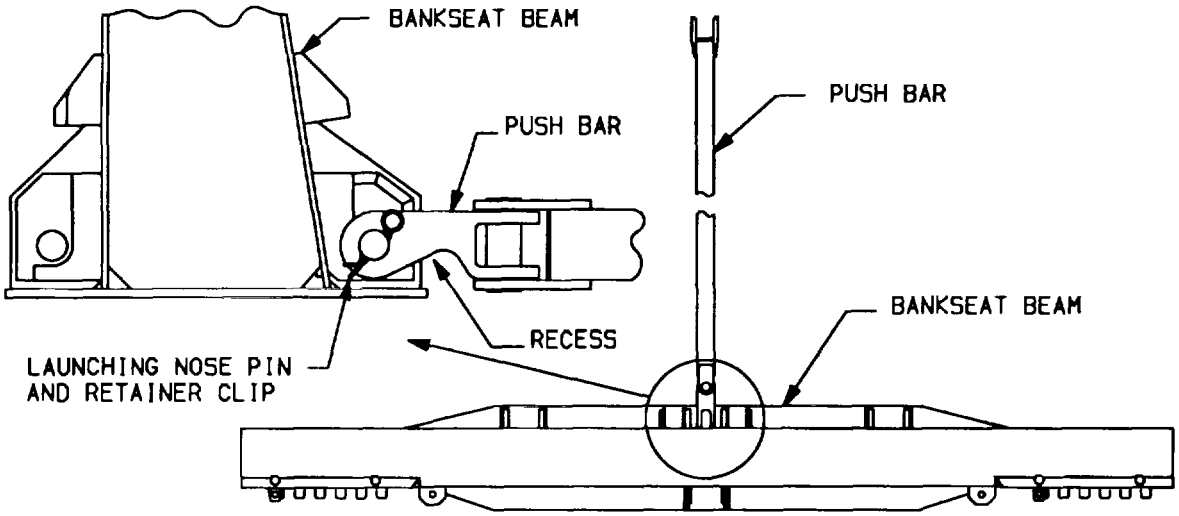
(12) Move push bar as needed to align holes in push bar and girder (if connecting to bankseat beam, see para. c.).

(13) Put bracing pin in girder until fully seated.



c. Connecting Push Bar to Bankseat Beam

When connecting the push bar to the bankseat beam, use a launching nose pin, secured with a retainer clip. The push bar must be the correct way up so the recess in the swivel end allows the push bar to articulate.



d. Booming

To boom the bridge to the given panel point:

(1) Unlock rollers of both roller beams (para. 4-5e.). It may require the vehicle to move the bridge slightly away from gap, then toward the gap to release all catches.
(2) Move the vehicle forward slowly. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

WARNING

Do not use locks In rollers as a brake during booming. Wait until the bridge has stopped before Inserting lock catches or bearing pads.

(3) Stop boom of bridge at given panel point. Lock rollers. Movement of the bridge backwards and forwards as described in step (1), may be required to lock all catches, or insert capsill bearing pads.

e. Disconnecting Push Bar

There are two alternative drills to disconnect the push bar:

(1) Disconnect the push bar from the cross girder (or bankseat beam) and back vehicle straight back on the centerline, carrying the end of the push bar while doing so. Then remove push bar cross girder from pin jaws of top or bottom panel.

OR

(2) Disconnect push bar from vehicle, then disconnect the cross girder from the top or bottom panel. Three personnel carry the push bar and cross girder assembly away from bridge in a convenient position for next boom.

4-19. BOOMING/LAUNCHING THE BRIDGE

This paragraph describes the commands and actions required to boom or launch (includes boom during delaunch) the bridge. The NCOIC of the bridge should provide instructions to the building party and vehicle operator

as to the proper conduct of a bridge boom or launch, ensuring to give all details about the commands and actions, hand signals, and all safety items.

a. Bridge on RB or FRB and RRB.

Bridge is on locked roller beams. Bridge will be boomed by manpower or by vehicle which has been connected to the bridge with a push bar.

(1) Command: Prepare to boom.

WARNING

Personnel will not use carrying bars to boom the bridge. Use of carrying bars can result In death or Injury to personnel.

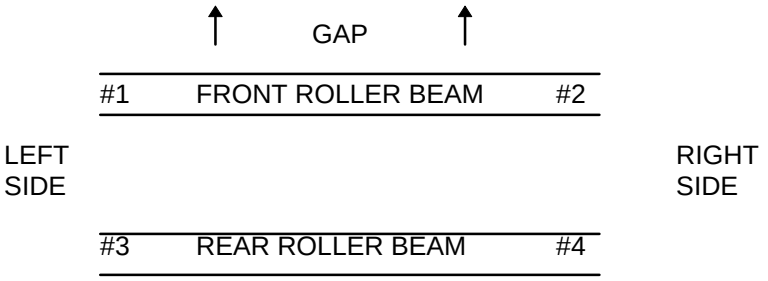
(2) Action: Personnel. Personnel take positions at the sides of the bridge and roller beams. Personnel will put hands only on the bridge, no carrying bars will be used. Personnel on roller locks will stand ready to unlock rollers.

(3) Command: Locks out.

WARNING

Personnel are advised to use extreme caution during locking and unlocking of the rollers. Once the rollers are locked or unlocked, move hands and arms from between the bridge and the adjustable supports. Do not put hands or arms Into the area any more than necessary. Failure to stay alert while operating locks can result in injury.

(4) Action: Personnel. Personnel on roller locks will attempt to pull locks out. Personnel on locks are assigned numbers as shown below and will provide responses to NCOIC by number when called to do so.



(a) NCOIC. NCOIC will immediately call out numbers 1, 2, 3, & 4 one at a time.

(b) Personnel. Numbered lock personnel will respond with their number and 'OUT' or 'IN'. If response is 'IN' they will identify direction bridge must be boomed to free lock, either 'TOWARD' or 'AWAY FROM' the gap.

(c) NCOIC. Upon receiving the report, the NCOIC will direct the personnel or vehicle operator to boom the bridge in the appropriate direction. When directing the vehicle operator, the NCOIC will use standard hand signals to ensure that the operator understands that the movement at this time is only a very small movement of the bridge.

(d) Personnel. When lock is free, person on that lock will call out to the NCOIC the number and 'OUT', and then step back away from the roller beam.

(5) Command: (Preparatory) 'TOWARD' or 'AWAY FROM' the gap.
followed quickly by:
Command: (Execution): Boom.

(6) Action: Personnel. Personnel boom the bridge in the direction ordered slowly, steadily and under control.

(a) Vehicle operator. Vehicle operator will follow hand signals given by the NCOIC to boom bridge in the direction required..

(b) NCOIC. The NCOIC will control the boom, using verbal commands (for personnel) and hand signals (for vehicle operator), ensuring to keep control of the bridge. As the panel point for the boom or launch approaches within 4 panel points of the appropriate roller beam the NCOIC will slow the crew or vehicle in preparation for stopping. Sudden stops are to be avoided.

(7) Command: Stop boom.

(8) Action: Personnel. Personnel or vehicle operator will stop booming of the bridge, and hold bridge in place. If panel point called for has not been reached or has been exceeded, NCOIC will at this time give crew or vehicle operator instructions to boom slightly to that panel point.

(9) Command: Locks in.

(10) Action: Personnel. Personnel on roller locks will attempt to insert roller locks.

(a) NCOIC. NCOIC will immediately call out numbers 1, 2, 3, & 4 one at a time.

(b) Personnel. Numbered lock personnel will respond with their number and 'OUT' or 'IN'. If response is 'OUT', they will identify direction bridge must be boomed to get lock in, either 'TOWARDS' or 'AWAY FROM' the gap.

(c) NCOIC. Upon receiving the report, the NCOIC will direct the personnel or vehicle driver to boom the bridge in the appropriate direction.

(d) Personnel. When lock is in, person on that lock will call out to the NCOIC the number and 'IN', and then step back away from the roller beam.

(e) NCOIC. NCOIC will direct crews back to other duties.

b. Bridge on CRB, FRB and RRB.

Bridge is on locked roller beams. Bridge will be boomed by vehicle only which has been connected to the bridge with a push bar.

CAUTION

The bridge MUST NOT be moved while the bearing pads are in and rollers down on the rocking rollers. The rollers of the rocking rollers (on CRB) must be In the full up position and the moveable bearing pads must be full out before the roller locks (on FRB/RRB) are unlocked. Failure to follow this sequence will result In damage to the rocking rollers.

(1) Action: Personnel. Personnel take positions at roller locks (on the FRB and RRB) and stand ready to unlock rollers. Additional personnel have been assigned to unlock the rocking rollers (on the CRB).

(2) Command: Locks out.

CAUTION

Personnel are advised to use extreme caution during locking and unlocking of rollers. Once the rollers are locked or unlocked, move hands and arms from between the bridge and adjustable supports. Do not put hands or arms into that area more than necessary. Failure to stay alert while operating locks can result in injury.

(3) Action: Personnel. Personnel on CRB roller locks will use the 19 mm ratchet wrench to operate both rollers on each rocking roller to the full up position. When both rollers are up, both of the moveable bearing pads on each rocking roller will be pulled to the full out position, CRB personnel will report to the NCOIC that the CRB is 'unlocked' once report is received, NCOIC, roller lock (FRB/RRB) personnel, and vehicle driver will follow steps a. (1) through (8) to unlock rollers and boom bridge to desired panel point.

(4) Command: Locks in.

(5) Action: NCOIC, roller lock (FRB/RRB) personnel, and vehicle operator will follow step a. (10) to lock rollers.

(6) Action: Personnel. After the FRB/RRB are locked, the personnel on the CRB rollers will push both moveable bearing pads to the full in position. When both moveable bearing pads are in, the 19 mm ratchet wrench will be used to operate both rollers on each rocking roller to the full down position, CRB personnel will report to the NCOIC that the CRB is 'locked'.

(7) NCOIC. NCOIC will direct crews back to other duties.

4-20. JACKING

After launching, it is necessary to lower the bridge down from the roller beam. Before disassembly, the bridge has to be raised onto the roller beams. This is achieved by jacking, using a crane (para. 4-22) or davits (para. 4-21).

a. General Principles

Jacking down both ends of bridge together to save time is NOT allowed. The sequence to be followed is ALWAYS:

(1) Lower far end of bridge using jack in the landing roller pedestal (single story over 8 bays and all double story) or jack, jack post and packing (single story up to 8 bays).

(2) Transfer weight of bridge from roller beam to two jacks on home bankseat beam.

(3) Jack onto packing when second or third stage jacking is necessary.

These general principles apply in the reverse when jacking up during disassembly.

WARNING

Never jack at one end of a bridge unless the other end Is fixed on locked rollers, on the ground, or secured to vehicle when on the capsill or forward roller beams.

Always ensure that head of jack Is Inserted correctly In jack hood and does not rest on edge or rim.

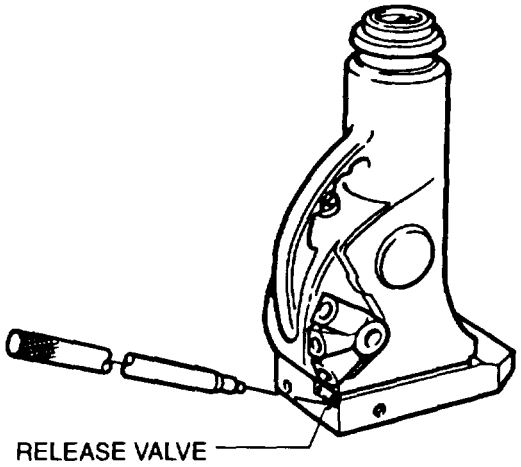
Never use Inner central bracket on bankseat beam for jacking up or down. Outer central bracket can only be used on single story bridges up to 5 bays.

b. Jack Operation

Before a load is applied to a jack, check that the jack head is inserted fully into the jack hood and when using with a building frame check that jack base is pushed firmly into jack seating.

To raise the jack

(1) Use jack handle to ensure that release valve is fully closed. DO NOT OVERTIGHTEN.



(2) Insert jack handle into most convenient hole in quadrant and operate. When the jack is at maximum lift a safety mechanism comes into operation and prevents further movement of the ram. As a check, the jack handle is equal in length to a fully extended jack.

To lower the jack

(1) Unscrew the release valve with the jack handle not more than one and a half turns. The amount of opening governs the speed of the ram. Only open the valve very slightly if the jack is to be lowered slowly.

To transport the jack

(2) When 15T jack is carried in equipment basket the filler cap must be uppermost. When a 20T jack is carried in equipment basket the air vent on the side of the jack must be kept uppermost.

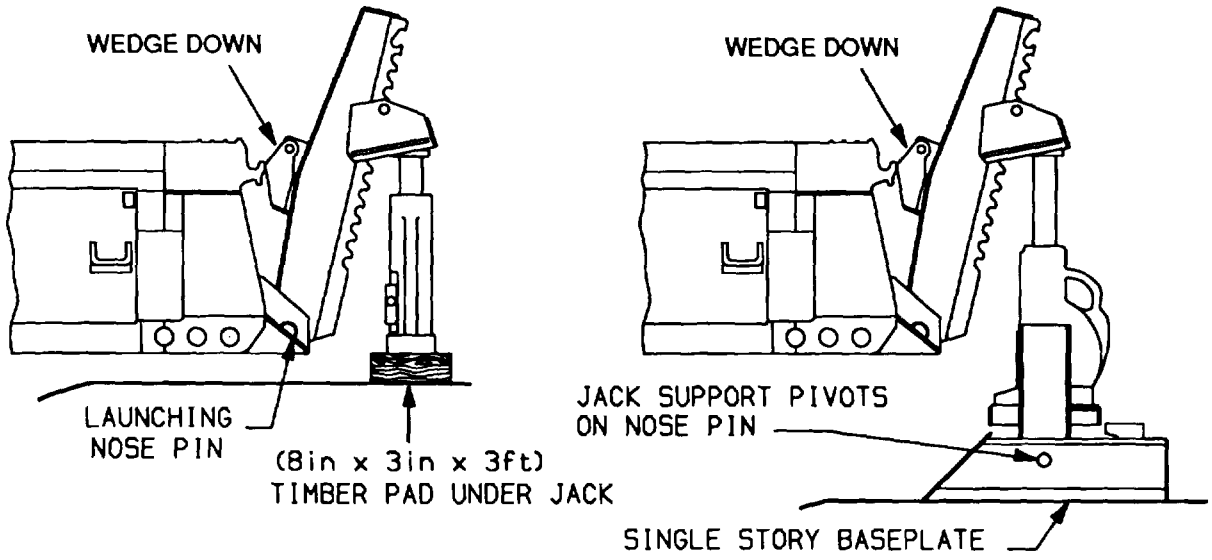
(3) Jack must be lifted by the body handle and NOT by the swivel head.

c. Jack Post and Jack - Single Story

A launching nose pin is used to connect the jack post to the outer brackets on the bankseat beam. The nose pin is secured by a retainer clip. On single story bridges the wedge is used to pack out the jack post and the hook is NOT engaged on the bankseat beam ledge. The jack is placed on timber packing (3 in x 8 in x 36 in) parallel to the bankseat beam, or, if conditions are bad, a single story baseplate with a jack support. Positioning the wedge between the jack post and the bankseat beam rail ensures that the bridge will clear the jack and baseplate when it is lowered to the ground.

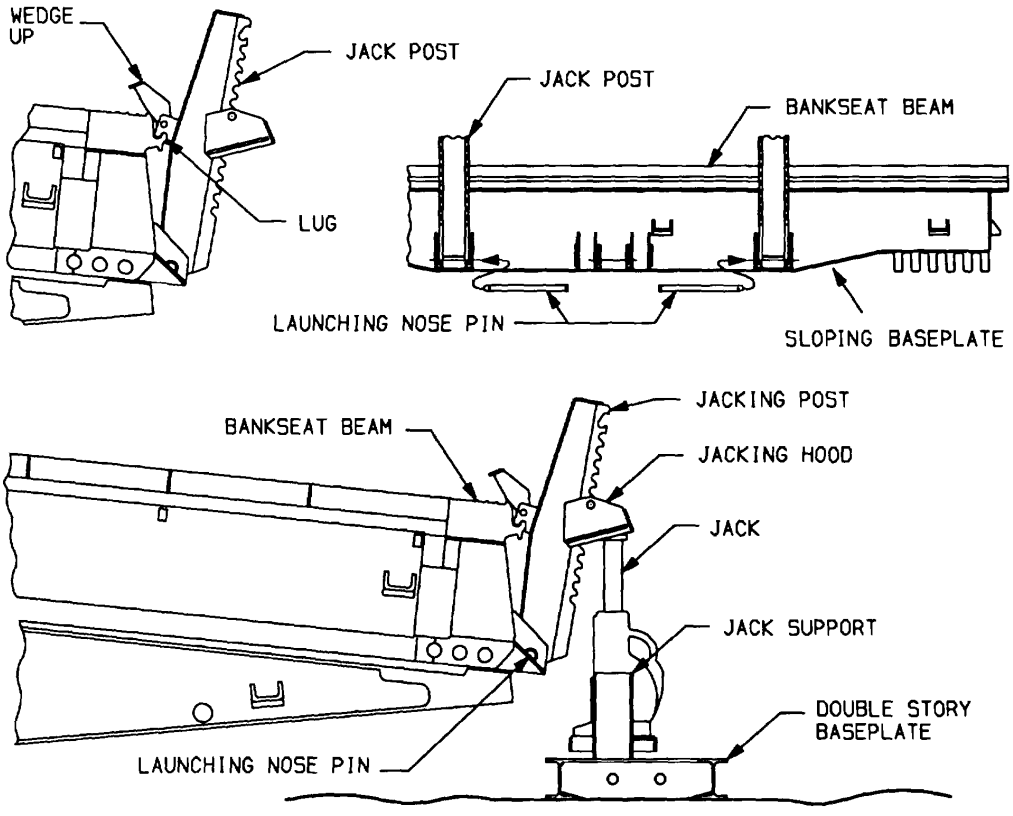
If the jack post is to be fitted before launch or de launch, it will be necessary to secure the jack post by raising the wedge and hooking the jack post to the bankseat beam rail. Then, when the jack post is to be used for jacking the wedge must be repositioned to the down position as shown.

WARNING
When fitting or carrying the jack post, hold the jack hood to prevent it from falling.


WEDGE DOWN
LAUNCHING NOSE PIN
(8in x 3in x 3ft) TIMBER PAD UNDER JACK
WEDGE DOWN
JACK SUPPORT PIVOTS ON NOSE PIN
SINGLE STORY BASEPLATE

d. Jack Post and Jack - Double Story

A launching nose pin is used to connect the jack post to the outer brackets on the bankseat beam, secured by a retainer clip. The pin is inserted from the inside and must not be pushed too far such that it fouls the sloping section of the bankseat beam baseplate. On double story bridges the hook on the jack post is engaged on the bankseat beam ledge. The jack is placed on a double story baseplate and a jack support.



e. Jacking Down - Single Story up to 8 Bay

After final launch, the drill for jacking the bridge down is as follows:

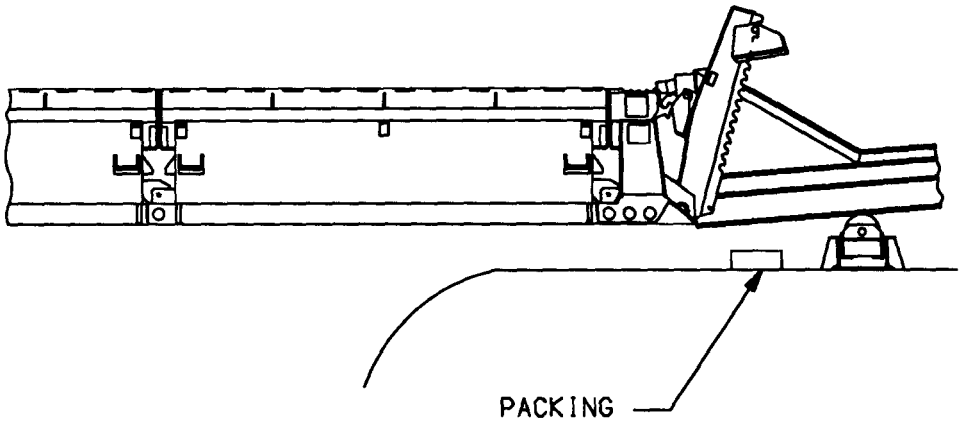
(1) Take jack, jack handle and one piece of packing to far bank.

(2) Use a nose pin to pin a jack post to outside jack post bracket on far bank bankseat beam, on high side only.

(a) Put a retainer clip through end of nose pin.

(b) Ensure that wedge on jack post is between jack post and ramp ledge of bankseat beam (para. 4-20c.).

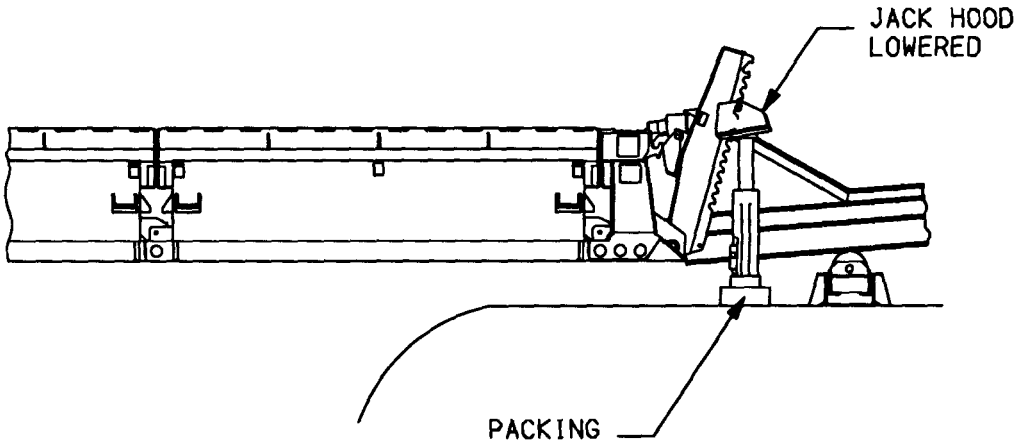
(3) Place one piece of packing (3 in x 8 in x 36 in) on the ground under the jack post, and parallel to the bankseat beam.



(4) Extend jack ram 9 in, DO NOT pull on head of jack, operate jack with the operating lever to obtain required height.

(5) Place jack on packing so that longside of base of jack is parallel to bankseat beam.

(6) Lower jack hood of jack post to head of jack. Ensure that head of jack fits into recess in jack hood.



(7) Operate jack to raise bridge until rear section of nose is clear of landing roller.

(8) Slide landing roller out from under launching nose.

(9) Operate jack to lower bridge to ground.

(10) Remove jack, jack post and packing.

(11) Remove retainer clip and nose pin from rear nose section and bankseat beam.

(12) Remove rear section of light nose from bankseat beam, and move it to side of site.

(13) Return jack, jack handle, jack post and packing back to near bank.

NOTE

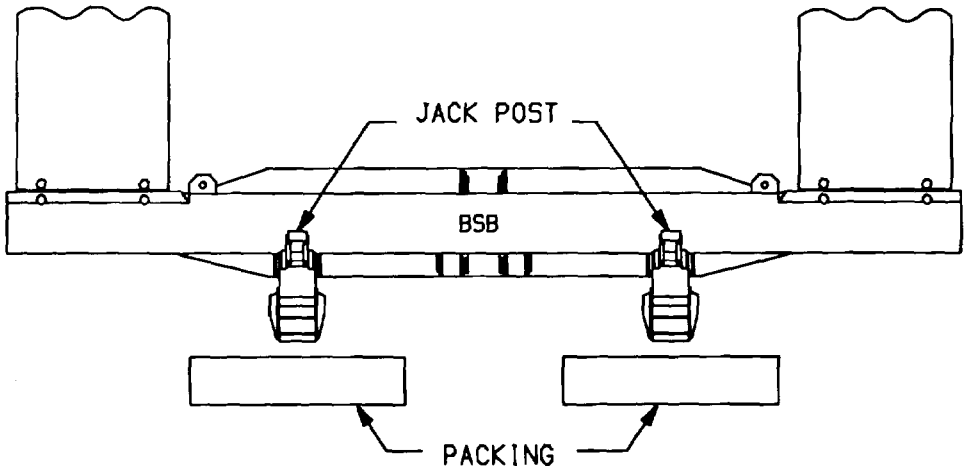
If site conditions allow, then for bridges up to 5 bays it is possible to use only one jack to jack down the near bank end of bridge. Use the most convenient of the three jacking positions on the bankseat beam. The procedures below describe the use of two jacks.

(14) Using a nose pin, pin a jack post to outside jack post bracket on each end of near bank bankseat beam.

(a) Put a retainer clip through end of nose pin.

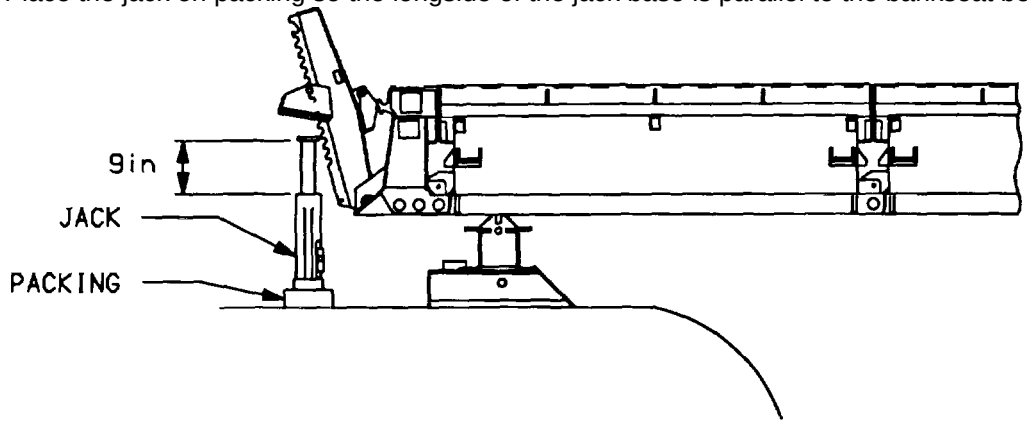
(b) Ensure that wedge on jack post is between jack post and ramp ledge of bankseat beam (para. 4-20c.).

(15) Place one piece of packing (3 in x 8 in x 36 in) on ground under each jack post, and parallel to bankseat beam. If ground conditions are bad, use a single story baseplate with a jack support.



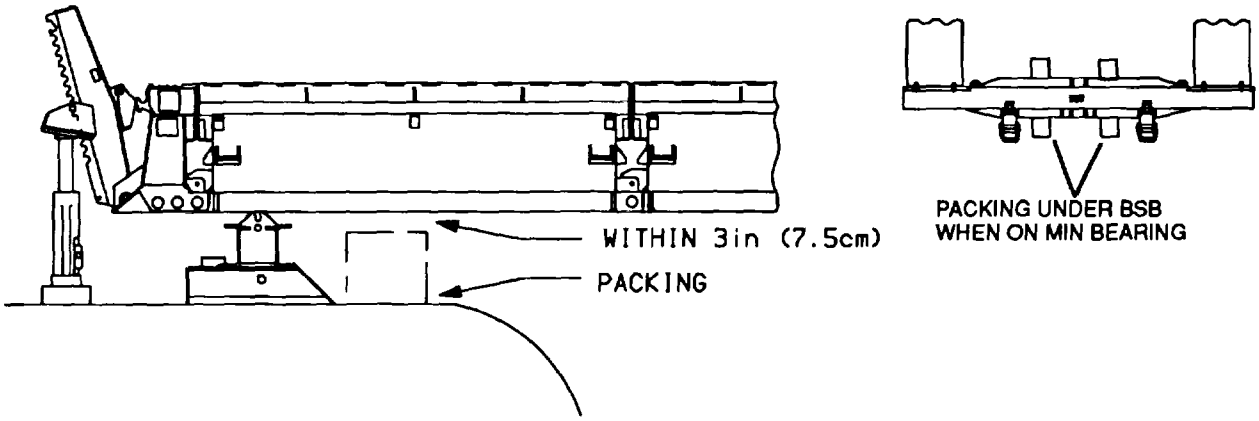
(16) Extend jack ram 9 in (23cm)

(17) Place the jack on packing so the longside of the jack base is parallel to the bankseat beam.



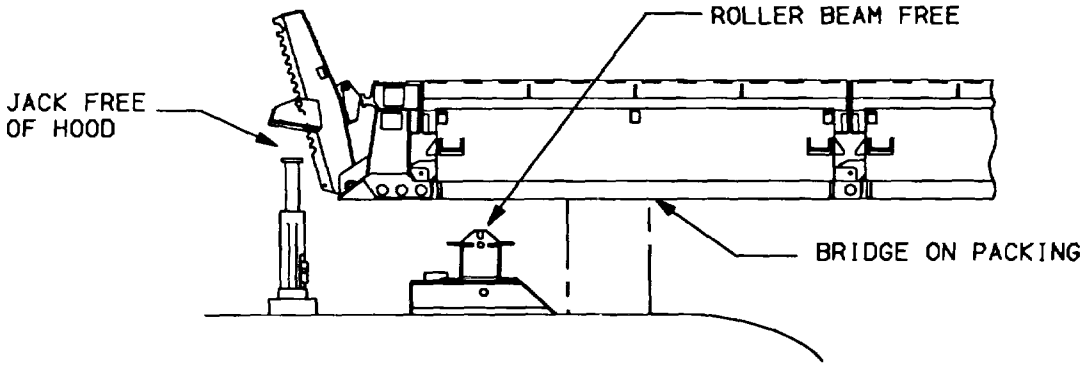
(18) Lower the jack on packing so the longside of the jack base is parallel to the bankseat beam.

(19) Stack packing under the bridge until the packing is within 3 in (7.5cm) of the bottom of the bridge. Placing can be all timber or timber and deck units. If a minimum bearing 1.3ft (0.4m) is being used, place packing under bankseat beam until roller beam is removed, then place under girders. Otherwise, place packing directly under girders.



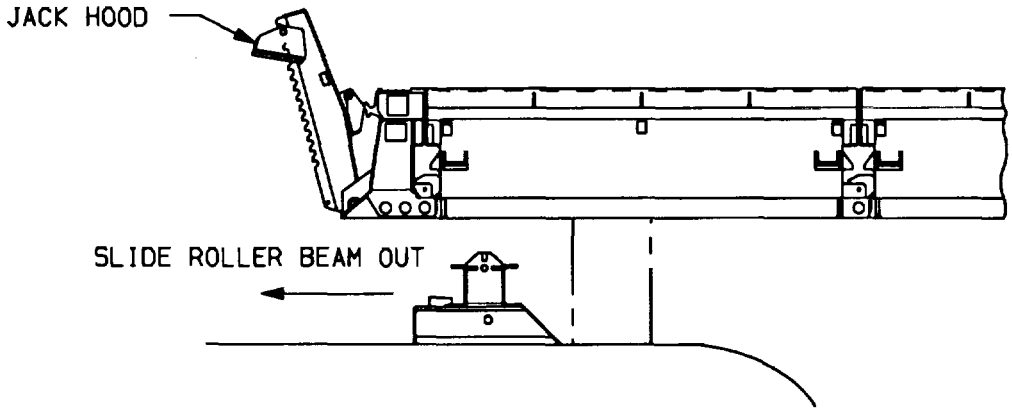
(20) Operate jacks to raise the bridge from the roller beam. Continue to raise bridge until more packing can be inserted between the stack and girder.

(21) Operate jacks to lower bridge onto packing. Stop lowering when the jack is free of the jack hood. DO NOT lower jack all the way.



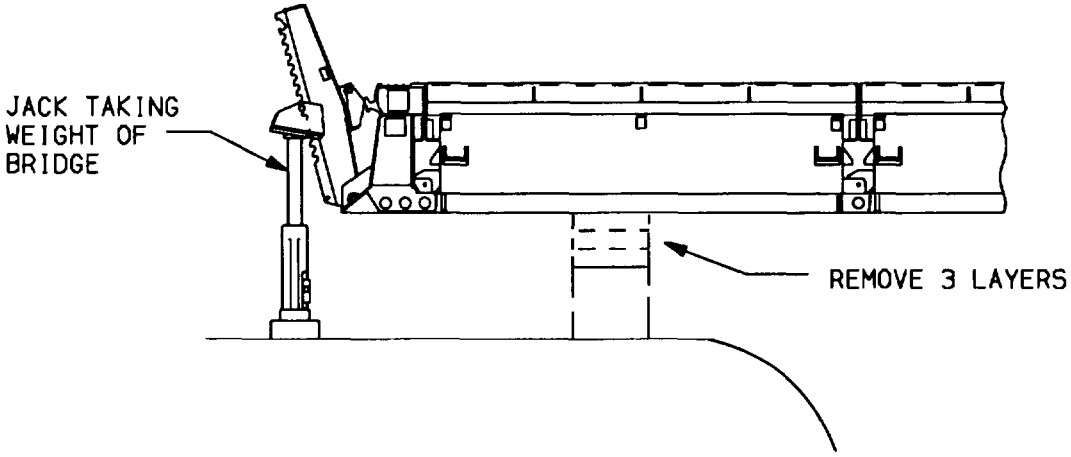
(22) Remove the jacks and packing from under the jack posts. Secure the jack hood in the top of the jack post.

(23) Slide roller beam out from under the end of bridge and disassemble.

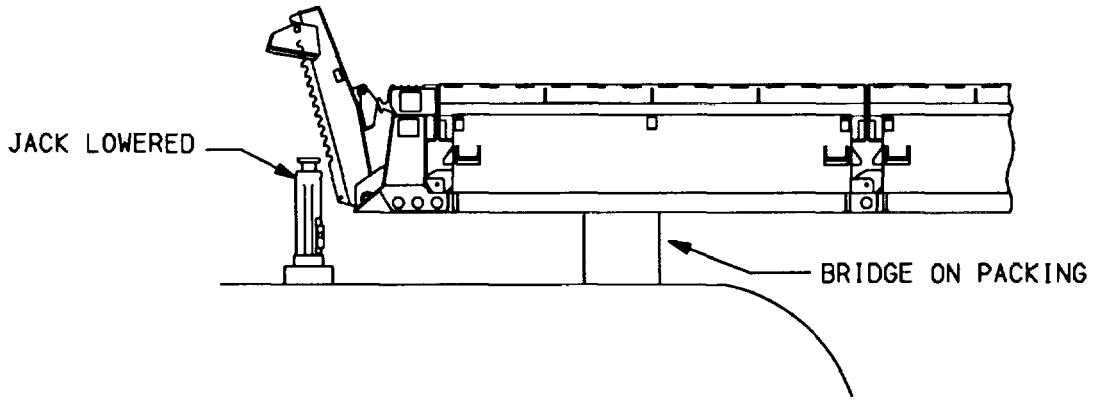


(24) Place packing and jacks under jack posts. Lower jack hood to jack head.

(25) Raise jacks to take weight of bridge off of packing. Remove no more than three layers of packing.



(26) Lower bridge until jacks are almost completely down, so that they will be free to be removed when the bridge rests on packing.



(27) Lift jack hoods from jacks; secure jack hoods in top teeth of post.

(28) Remove jacks and extend ram 10 in (25 cm).

(29) Place jacks under posts and lower hood to jack head.

(30) Operate jacks to raise the bridge from the packing. Remove no more than three layers of packing.

(31) Continue this process, steps (25) to (30) until the bridge is lowered onto the bank.

(32) Remove jack posts, packing and jacks.

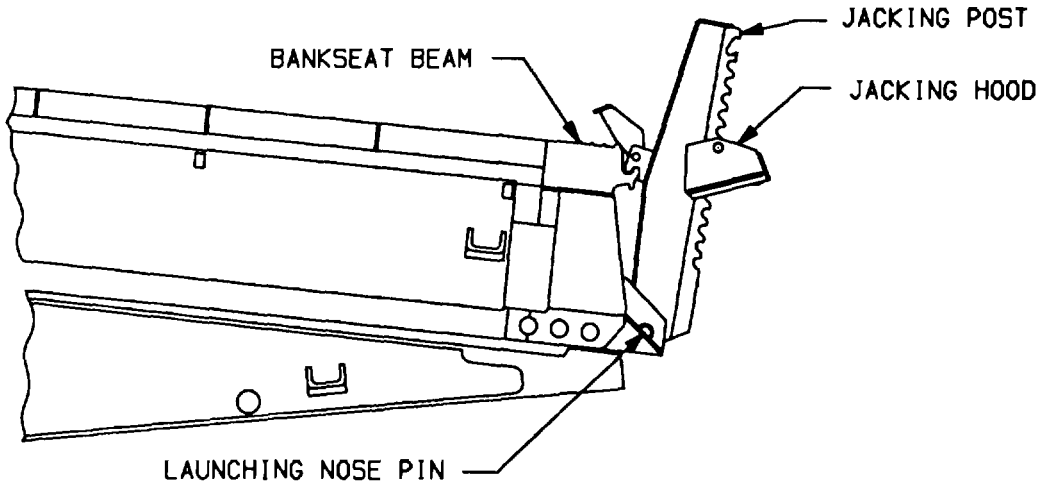
f. Jacking Down - Single Story over 8 Bay and All Double Story

After final launch and the far bank has been lowered using the landing roller pedestal, the drill for jacking down the home bank is as follows:

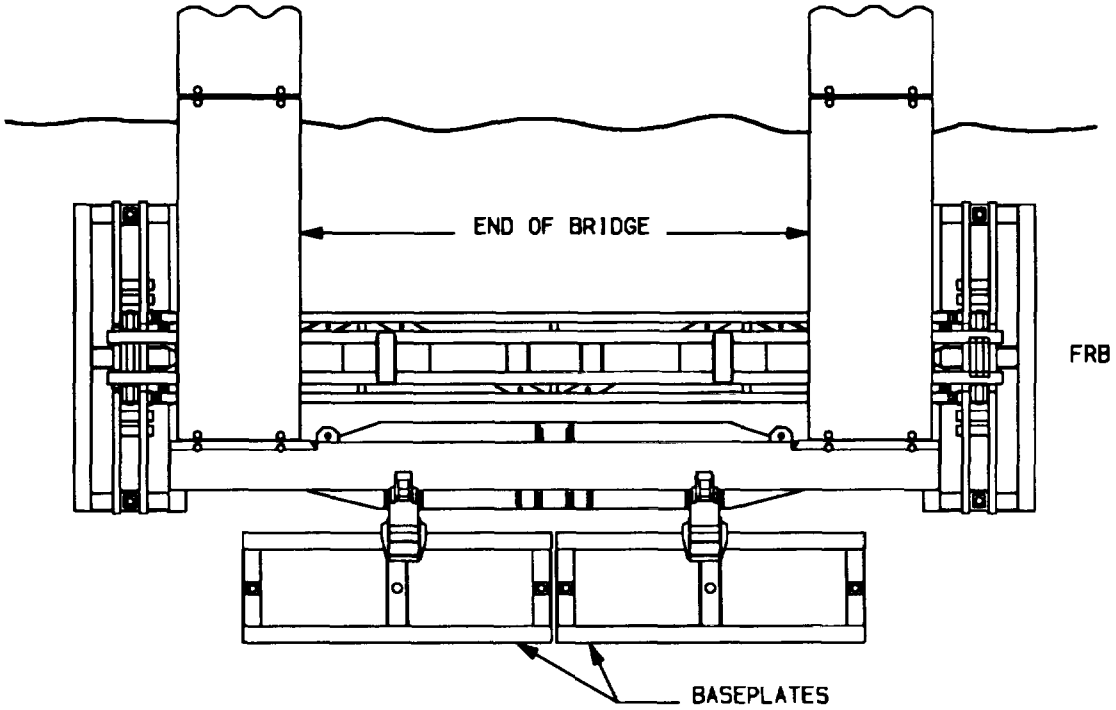
(1) On double story bridges ensure rollers on front roller beam and rear roller beam are locked.

(2) On double story bridges lower roller beam to about 2nd pin hole from bottom.

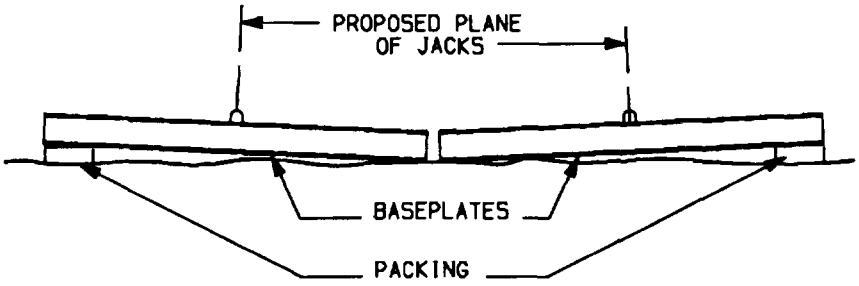
(3) Place lugs of jack posts in ramp ledge of bankseat beam (para. 4-20d.) or place wedge of jack post between post and bankseat beam (para. 4-20c.). Guide bottom of jack posts into brackets on outside of bankseat beam. Pin jack posts to bankseat beam with nose pins put in from the inside of the bracket to the outside. Secure nose pin with retainer clip.



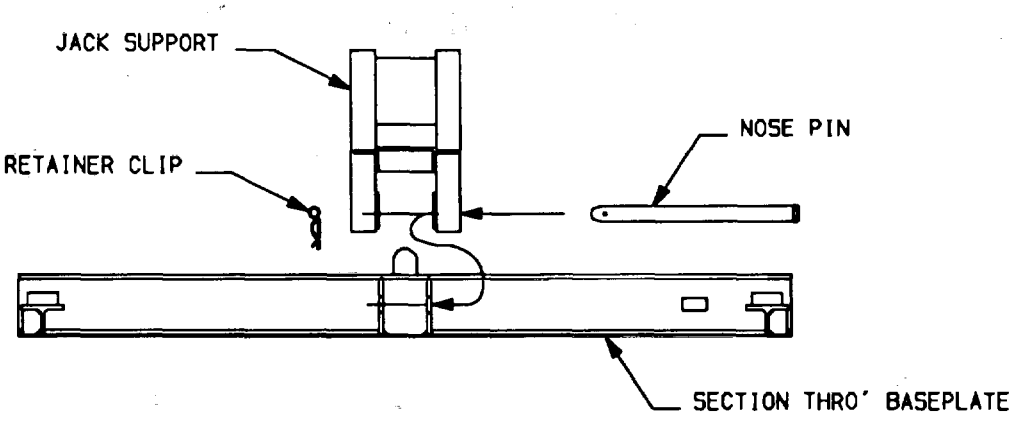
(4) Position two double story baseplates at end of bridge. Baseplates are placed end to end at centerline.



(5) Place packing under baseplate as needed to make jacks lean slightly toward each other. Jacks must lean inward at the top to increase stability.



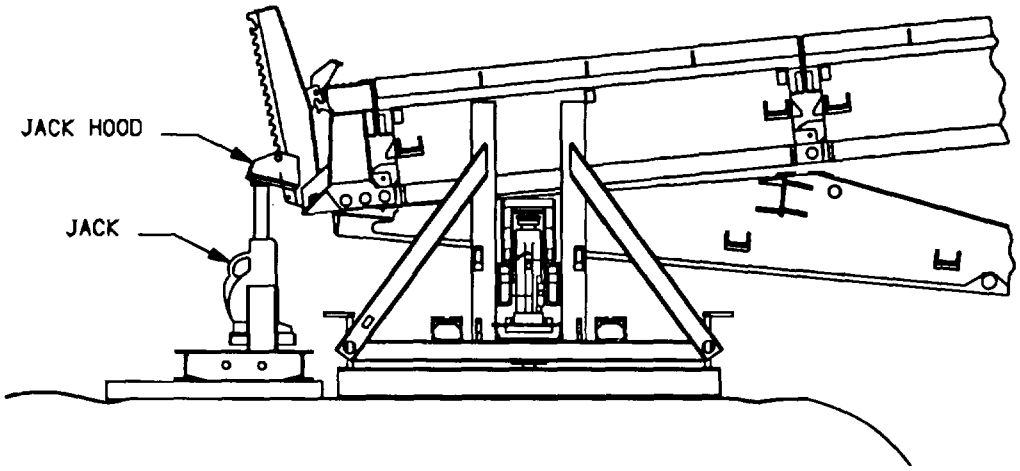
(6) Pin a jack support to each baseplate with nose pin and secure with retainer clip.



(7) Prepare four jacks for use by operating jacks until 9 in (23 cm) of ram is showing.

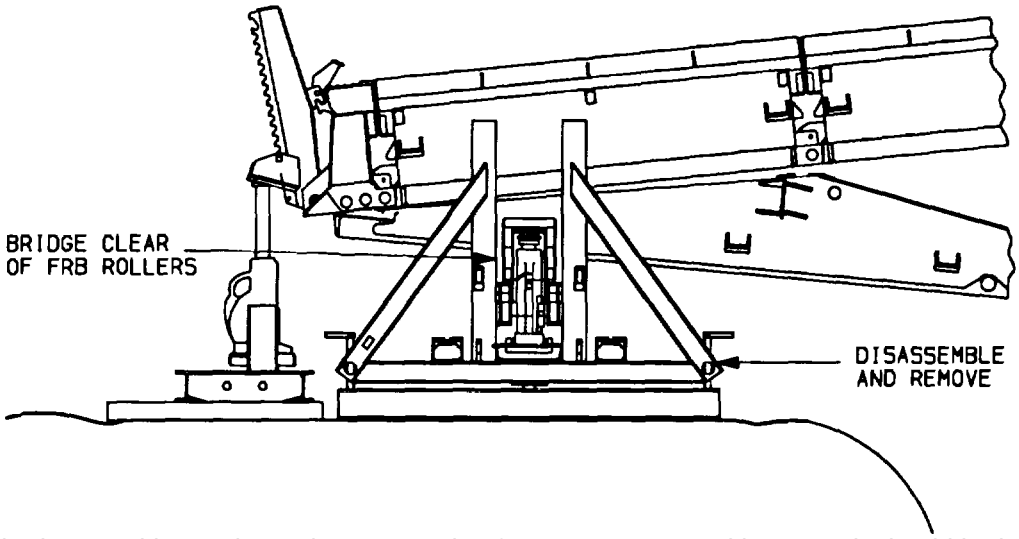
(8) Place two jacks into jack supports.

(9) Lower jack hoods to jack head.

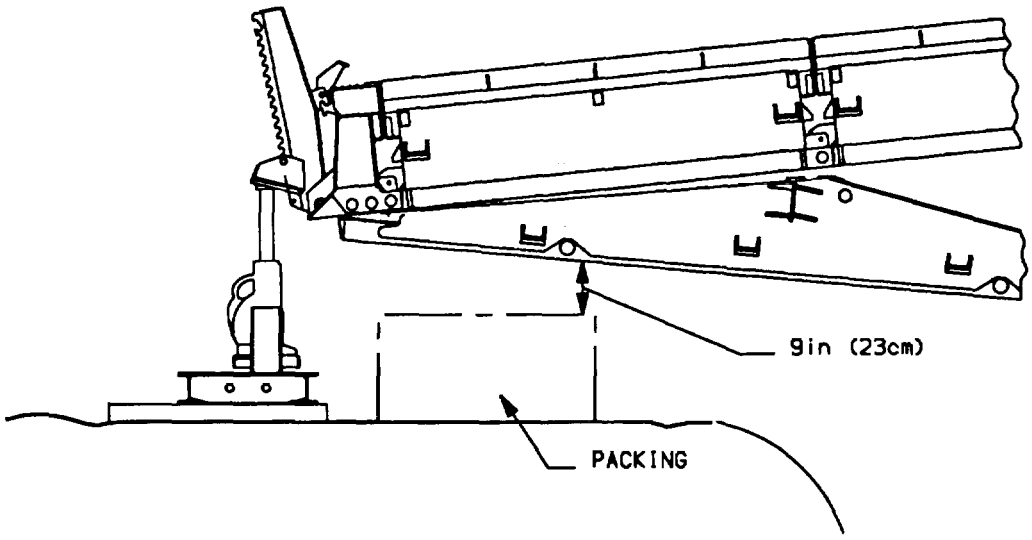


(10) Hold hood of post against jack head and jack post. Raise jacks to take weight of the bridge from the front roller beam. The weight of the bridge is resting on the jacks. Operate both jacks together and keep bridge as level as possible.

(11) Remove front roller beam by pulling it out to one side of the bridge. Operate retractable pins in roller beam to enable roller beam to be withdrawn side ways through the adjustable support. Then disassemble remainder of front roller beam.



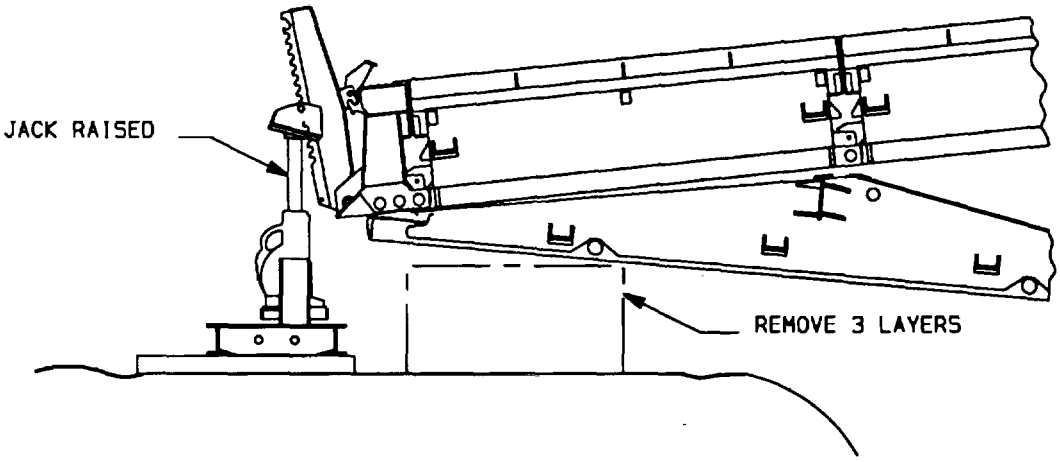
(12) Place packing under end taper panel to form temporary packing. Stack should be built to within 9 in (23 cm) of end taper panel.



(13) Operate jacks to lower bridge onto packing. Remove hood from jacks.

(14) Remove jacks and replace immediately with other two jacks. Reposition jack hoods to head of jacks.

(15) Raise jacks to take weight of bridge off packing. Remove no more than three layers of packing.



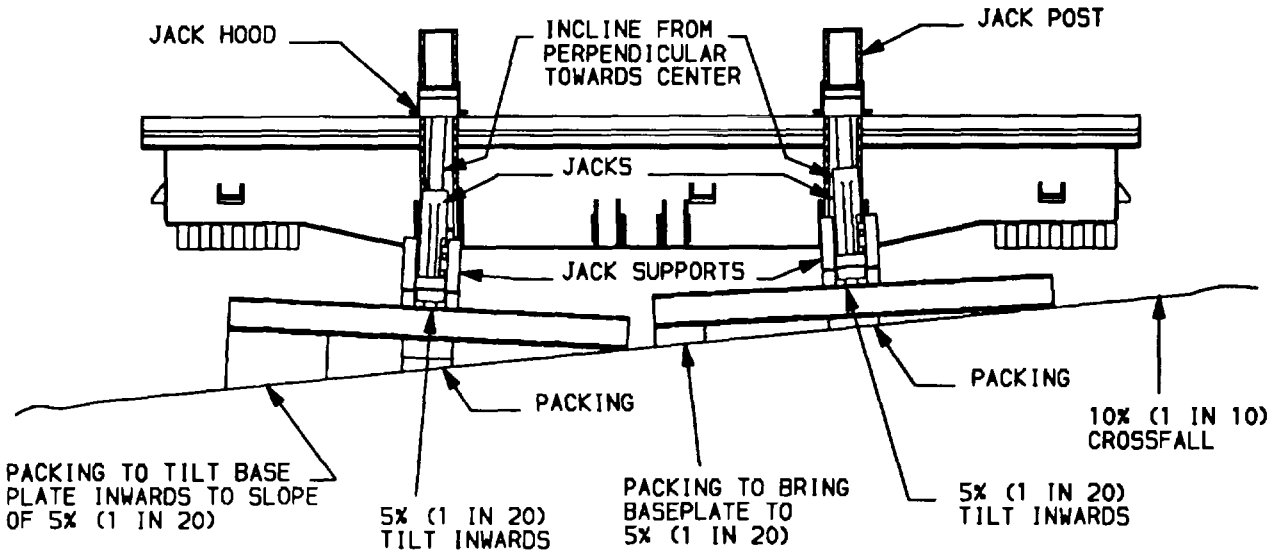
(16) Operate jacks to lower bridge onto packing or bank. If lowered onto temporary packing, repeat steps (14) and (15) to reposition jacks to get bridge onto bank.

(17) Remove all jacks, jack posts, supports, baseplates and loose packing from site.

g. Jacking When Home Bank has Crossfall

Although there is no need for any site work when the crossfall of the home bank does not exceed a slope of 5% (1 in 20), packing under the baseplates should be used to avoid one jack leaning outwards.

With a crossfall of 10% (1 in 10), one end of the bankseat beam will ground, while the other may still be 1 ft 3 in (380 mm) above ground. When this happens additional packing will be needed. MGB deck units interleaved with timber packing (to prevent metal to metal contact), can be used.


JACK HOOD
INCLINE FROM PERPENDICULAR TOWARDS CENTER
JACK POST
JACKS
JACK SUPPORTS
PACKING
PACKING
10% (1 IN 10) CROSSFALL
PACKING TO TILT BASE PLATE INWARDS TO SLOPE OF 5% (1 IN 20)
5% (1 IN 20) TILT INWARDS
PACKING TO BRING BASEPLATE TO 5% (1 IN 20)
5% (1 IN 20) TILT INWARDS

When jacking down in this situation, always ensure the tilt of the jack leans inwards at 5% (1 in 20).This is best achieved by adjusting the jack packing while the bridge is supported on packing and while the jack is being extended to a new hood position.

h. Jacking When Far Bank Has Crossfall

A slope of 5% (1 in 20) on the far bank can cause the side movement of a bridge. This is more obvious on:

(1) Bridges longer than 2E + 12 bays.

(2) When jacks are fully extended.

(3) When jacks have their narrow side of base parallel to bankseat beam.

If the jacks are set with a tilt inwards [para. 4-19f.(5)] side thrust may be prevented. To prevent further side movement, attach a puller cable to an anchorage.

4-21. DAVITS

a. General

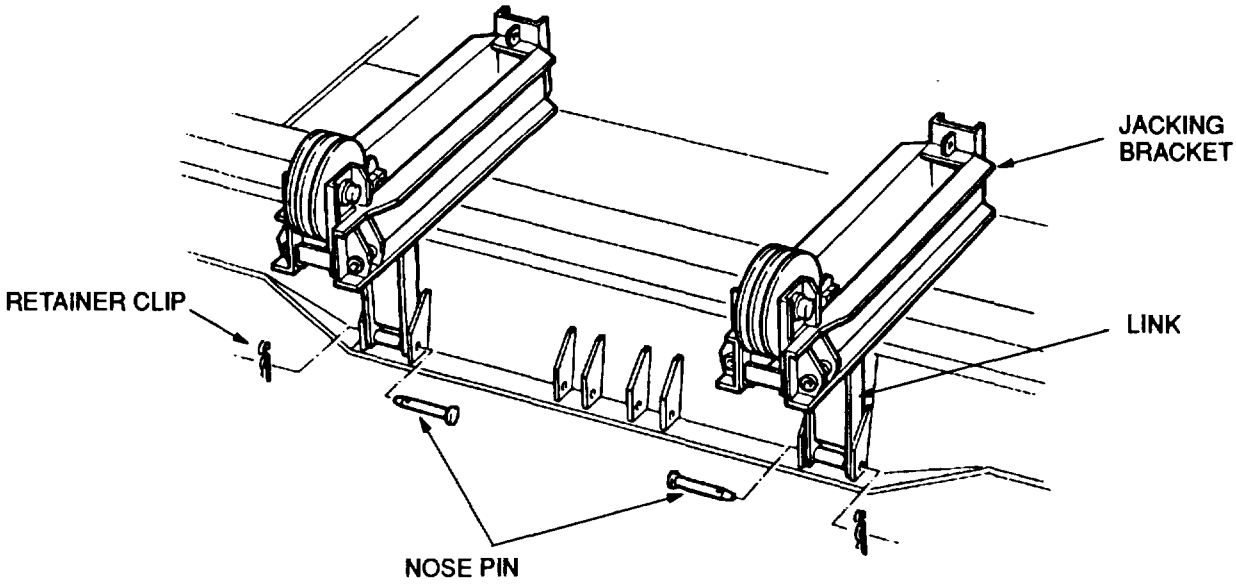
Davits can be used as an alternative to jacks or crane to lift/lower end of bridge. It is recommended that davits are used for bridges over 2E + 12 bays.

b. Lowering Bridge

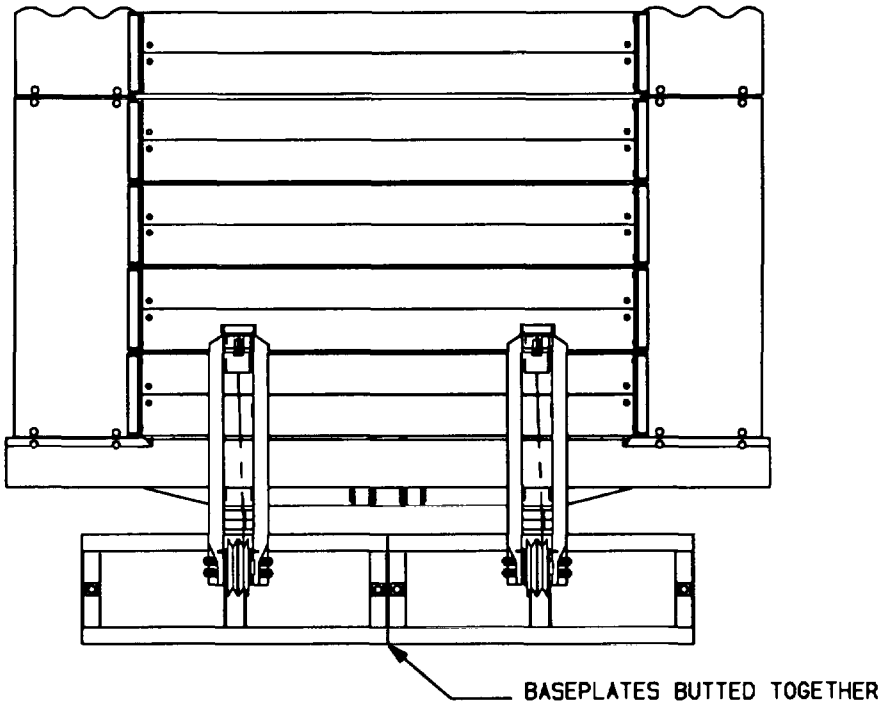
After final launch and the far bank has been lowered using the landing roller pedestal, the drill for lowering bridge using davits is as follows. If counterweight has been added it will be necessary to clear the counterweight decks and curbs at the end of bridge to enable the jacking brackets to be fitted, and allow room for a full stroke of the puller handles.

(1) Unpin jacking bracket link from its stowed position and place on deck and over jack post bracket on bankseat beam, ensuring to engage lugs of link on ramp ledge of bankseat beam.

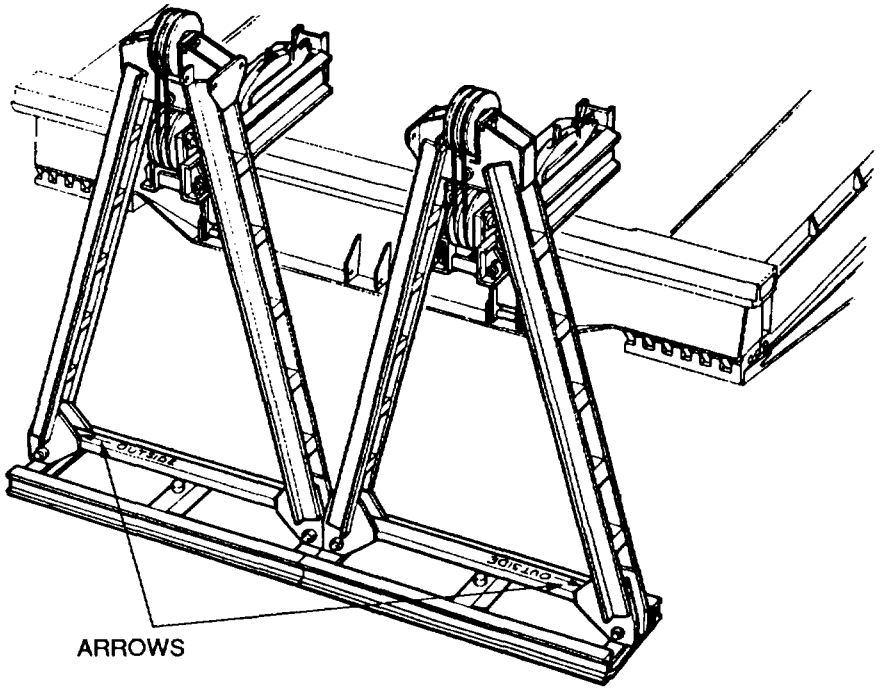
(2) Pin link to bankseat beam with a nose pin and secure with a retainer clip.



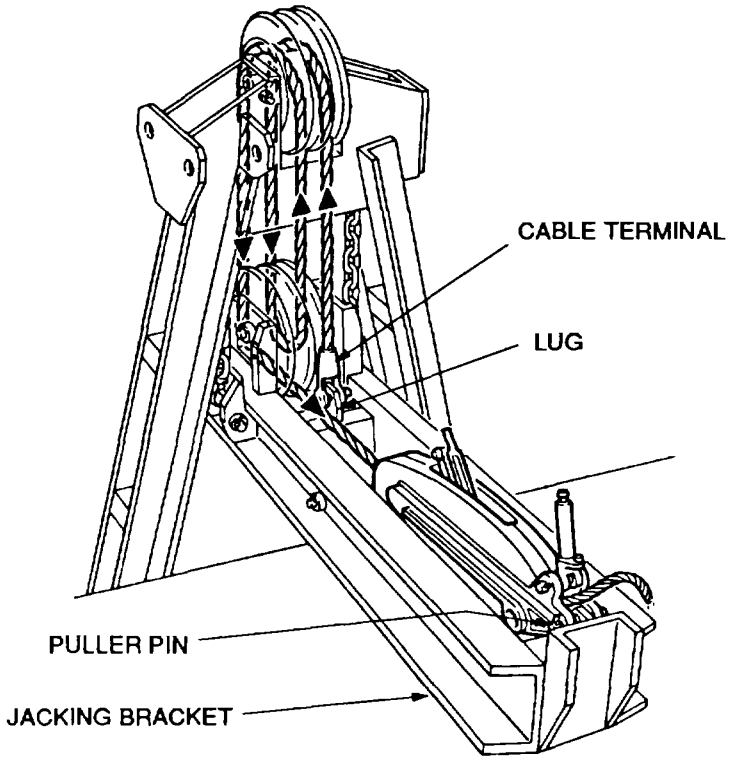
(3) Place two adjustable support baseplates about 6 in (15 cm) from final position of bankseat beam. Ends of baseplates butt together at centerline.



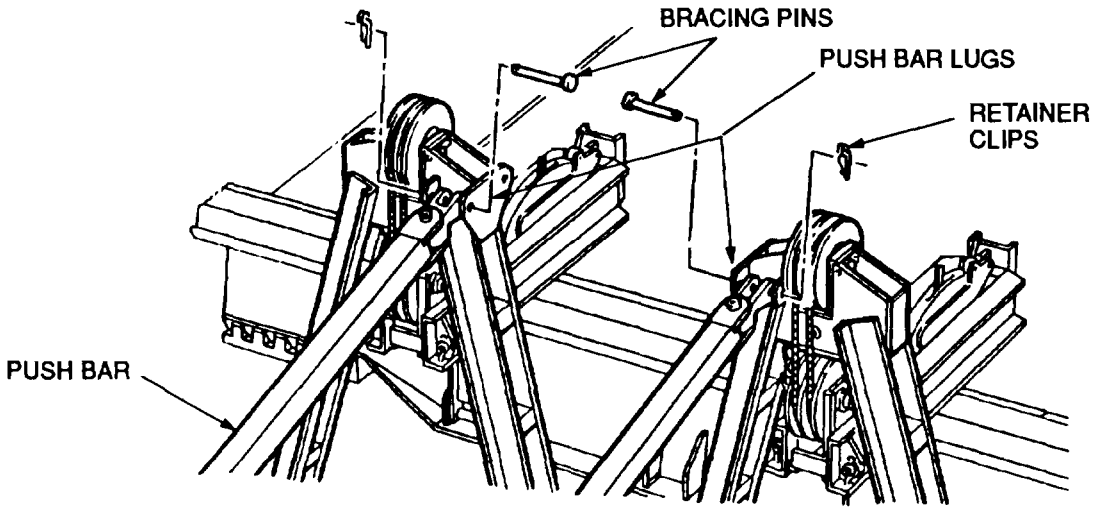
(4) Place one davit upright on each baseplate with arrows pointing to outside of bridge. Use the leveling screws or packing to ensure the davit pulleys are vertically in line with the jacking bracket pulleys 4-83 from the front and the side.



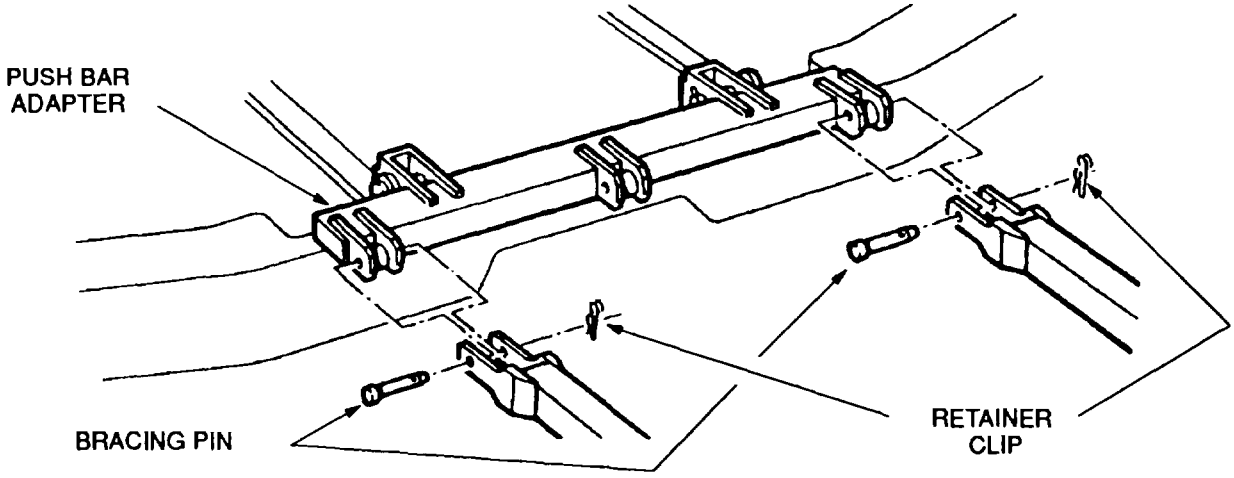
(5) Reeve puller cables. Connect the cable terminal to the lug and reeve cable around the pulleys then into the puller. Use the puller pin to connect the puller to the jacking bracket at the puller connecting lug.



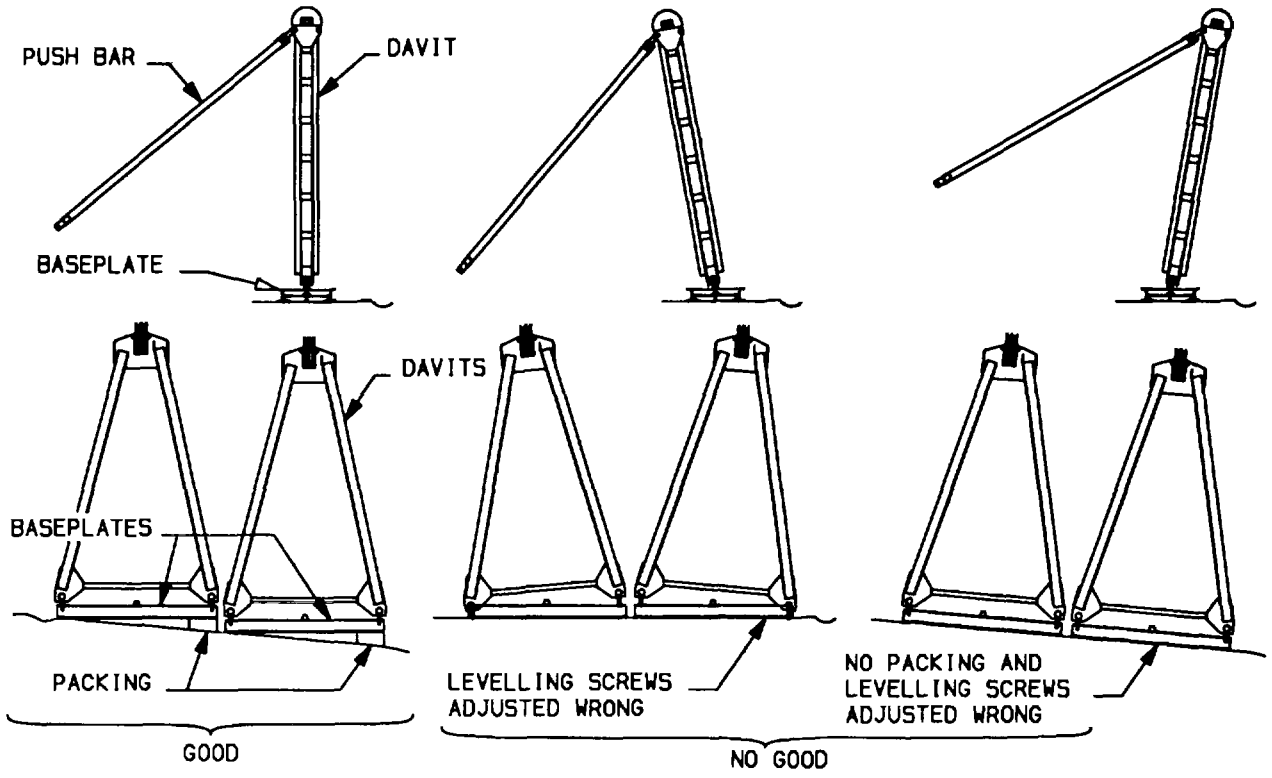
(6) Pin two push bars (short or long) to davits with bracing pins and secure with retainer clips.



(7) Position truck near end of bridge. Ensure that truck is straight with the bridge and centered over centerline. Move truck forward slowly and attach push bars to adapter on truck using bracing pin and retainer clip. Ends of push bars are attached to the outside brackets of adapter.

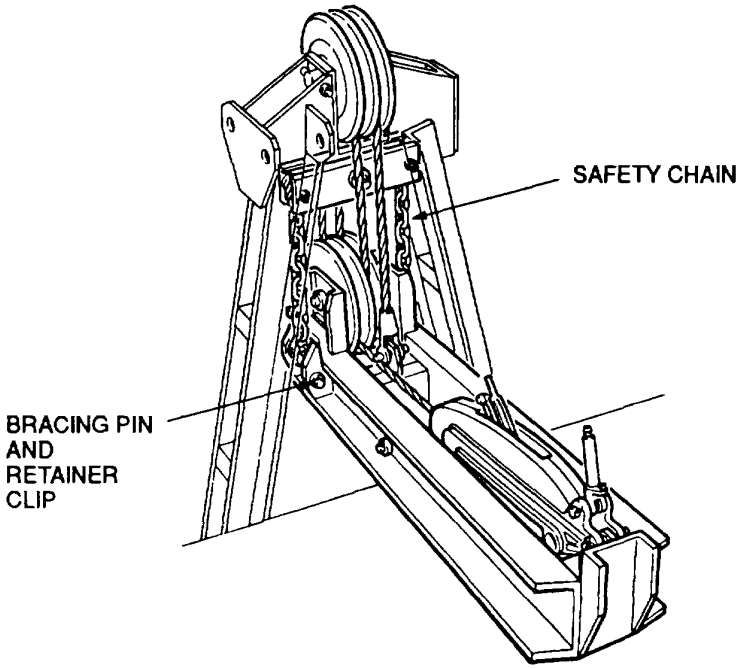


(8) Set davit posts and puller cables vertically in both directions by moving baseplates and truck as necessary. Baseplates may have to be levelled with packing.



(9) Lift bridge from roller beam with cable pullers using two personnel on each puller handle with handle fully extended. Ensure that the puller cable does not become fouled on the davit frame.

(10) Lift bridge until safety chains can be connected to jacking brackets. Secure both chains to brackets with bracing pins and retainer clips.



(11) Pay out pullers until weight of bridge is taken by safety chains.

(12) Slide roller beam out from under bridge. Remove or reposition packing.

CAUTION

While lowering the bridge carefully move the truck as necessary to keep the cables clear of the davit posts. This will result In the davit posts being slightly out of vertical at the end of lowering. Pickets may be required to secure or anchor baseplates.

(13) Operate cable pullers to lift bridge high enough to release safety chains. Operate cable pullers to lower bridge to ground or onto packing if required.

(14) Remove cable from pulleys and puller.

(15) Disconnect push bars from adapter and davit posts.

(16) Remove davit posts and baseplates.

(17) Remove jacking bracket from bankseat beam.

4-22. CRANE

a. General

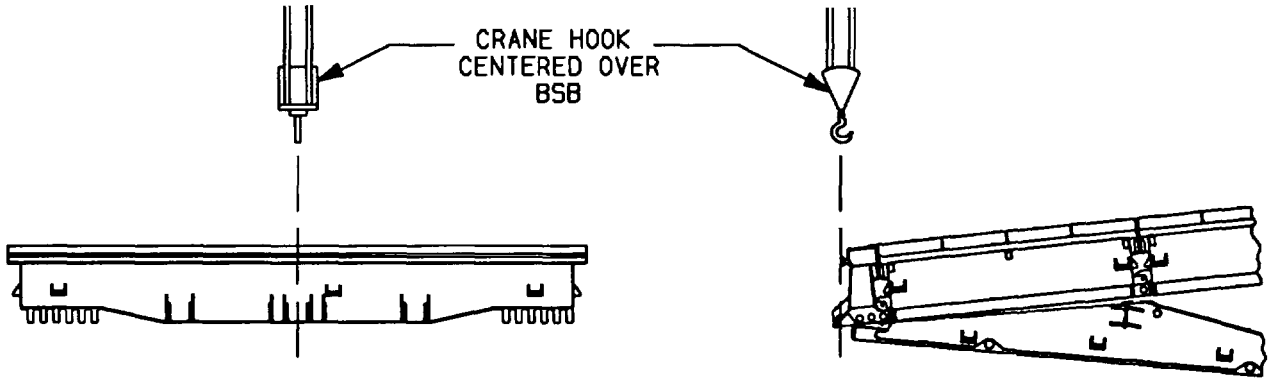
A crane can be used as an alternative to jacks or davits to lift/lower end of bridge. After final launch and the far bank has been lowered using the landing roller pedestal, the drill for lowering bridge using a crane is as follows:

WARNING

Ensure crane and slings are of sufficient capacity.

b. Lowering Bridge

(1) Position crane near rear of bridge on centerline. Ensure that hook and block of crane is centered over bankseat beam.



(2) Lower crane hook and attach four legged lifting sling. All four legs of sling will be used to lift bridge.

(3) Place hooks on two legs in each jack post bracket. Tip of hook must face outside of bankseat beam. Pin hooks in with a nose pin and secure with retainer clip.

(4) Operate crane to take the slack from the sling legs. Ensure that cables are not twisted.

(5) Lift bridge slowly and only high enough to permit the roller beam to be slid to one side of site, or back towards crane if there is sufficient space.

(6) Remove packing.

(7) Lower bridge slowly to ground or onto packing if required.

(8) Remove nose pins and hooks from bankseat beam. Remove slings from hook of crane. Move crane from site.

4-23. PACKING ENDS OF BRIDGE

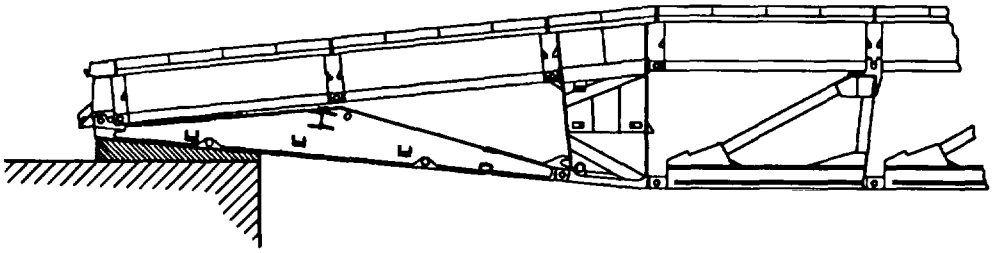
a. General

It may be necessary to pack the ends of the bridge to achieve a safe bearing on both banks:

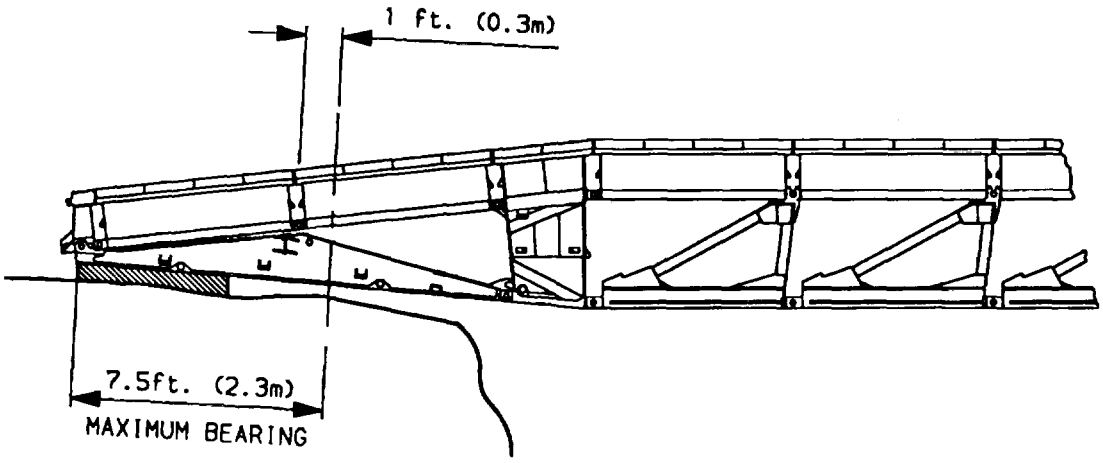
(1) If ground conditions are soft.

(2) To level the bridge when it has a cross slope.

(3) To give proper bearing if the bank is a hard prepared (steel or concrete) or natural (rock) abutment.



(4) To achieve proper bearing if the bridge has been over designed for the gap to be spanned.

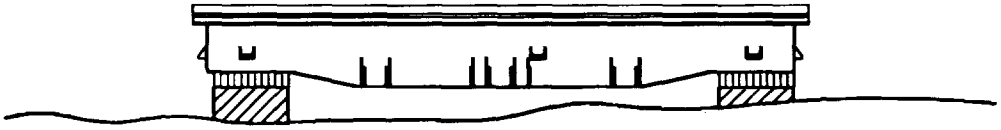


NOTE

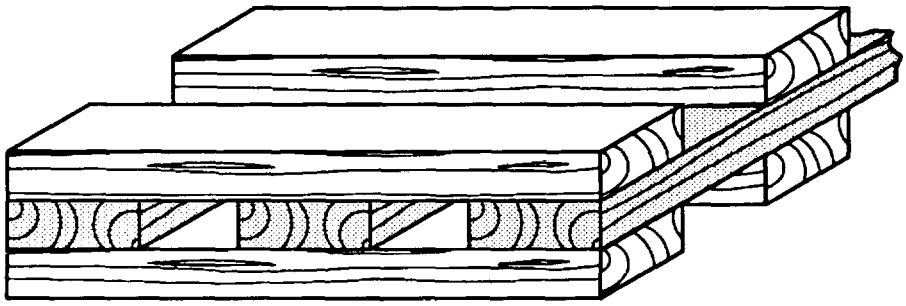
Bridges must be designed to achieve the correct bearing. Over design will result In excessive packing or ground removal.

b. Packing

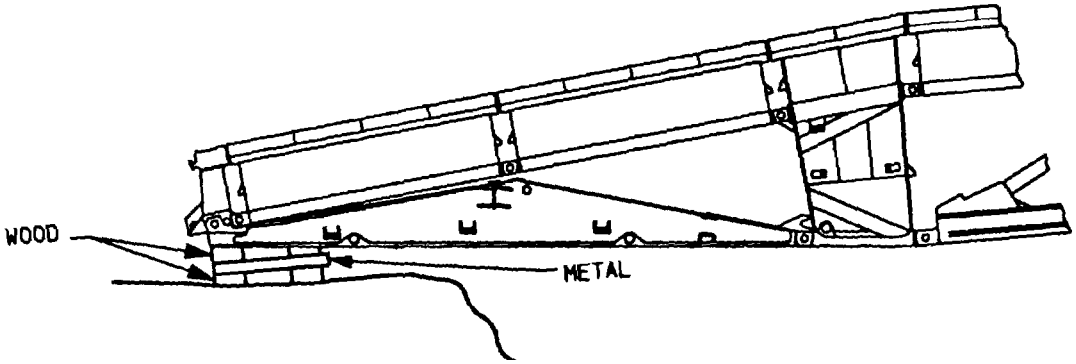
(1) Only pack under the girders of the bridge and do not exceed the bearing dimensions.



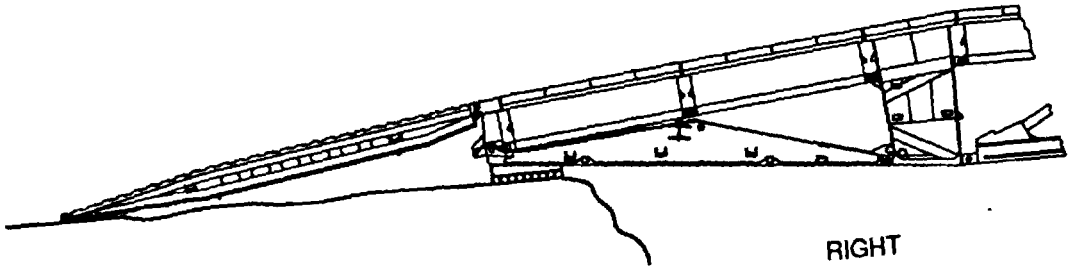
(2) If layers of packing are necessary, construct each layer at 90° to the previous one.

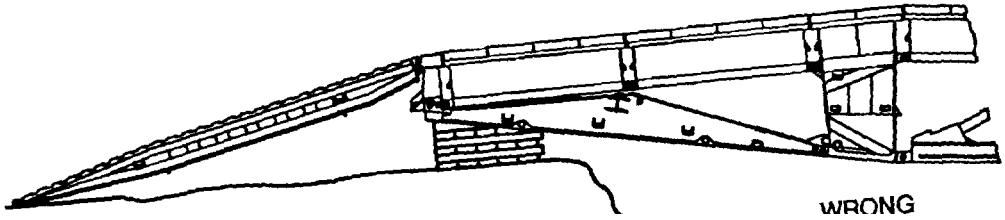


(3) Never have metal to metal contact. If metal is used for packing, each layer must be separated by a layer of wood to prevent slipping. Therefore the layer of packing in contact with the bridge must 4-89 be wood to prevent slipping and damage to the bridge bottom chord.



(4) Avoid excessive packing such that the end of bridge is too high causing the ramps to be at a steeper gradient than the end of bridge. Cut, fill or pack to ensure ramps sit properly at ground level.





4-24. LAYING RAMPS

a. General

The near bank ramps are fitted to the bridge first, then after the decking is laid, the far bank ramps are fitted. The drill is the same for both ends

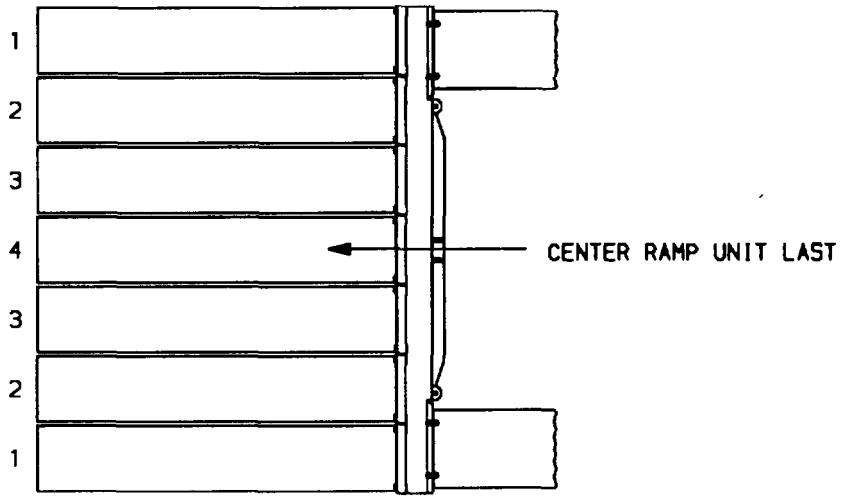
b. Procedure

(1) Fit ramps in pairs, starting with the outer pair.

(2) Hook ramp one about 9 in (23 cm) inboard from final position, then slide them sideways into place. This will engage the anti-lift lugs.

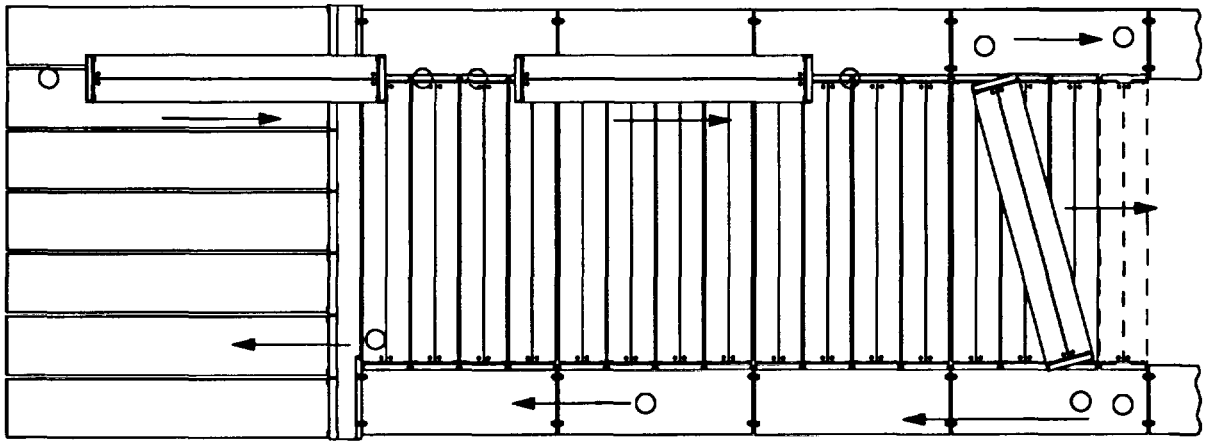
(3) Repeat procedure for ramp pairs 2 and 3.

(4) Finally hook the center ramp (4) into position. The bankseat beam has no anti-lift lugs for the center ramp.



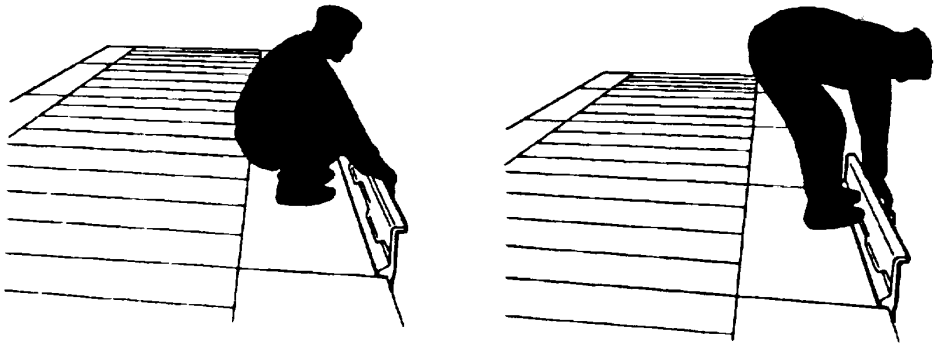
4-25. LAYING DECKS

Deck units are hooked on inside top panel rails, starting from the near bank side of bridge. One method is to carry them single file up one side of the bridge, the rear person then cross the center, place the deck unit, then walk off the bridge down other side.



4-26. FITTING CURBS AND GUIDE MARKERS

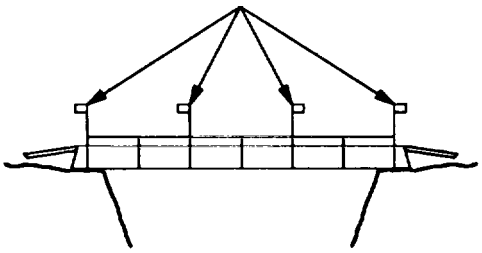
The curb is a one person load and fits on the outer top panel rail. The curb is not designed to fit a junction panel. The curb should be fitted with the person in the crouching position as shown below:



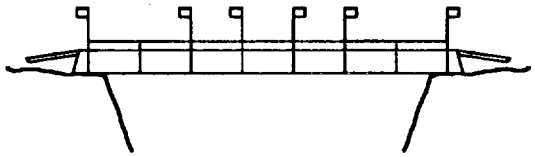
RIGHT **WRONG**

Bridge guide markers are placed in the hole at the end of the curb, as shown below:

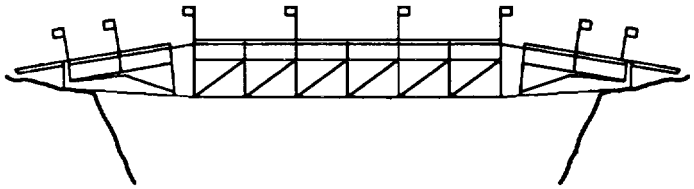
GUIDE MARKERS



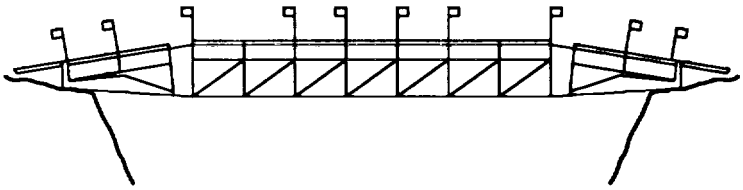
SINGLE STORY - EVEN No. OF BAYS



SINGLE STORY - OLD No. OF BAYS



DOUBLE STORY - EVEN No. OF BAYS



DOUBLE STORY - ODD No. OF BAYS

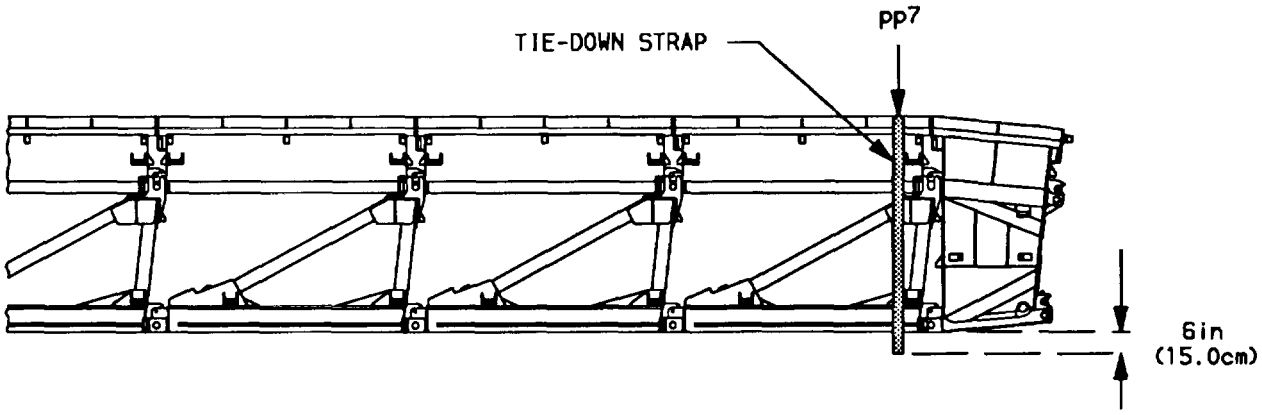
4-27. STRIPPING ON ORIGINAL FAR BANK

When stripping the bridge on the original far bank, different procedures are necessary. The bridge has been de-launched onto roller beams on the original far bank and safety packing placed between the gap and the forward roller beam (on normal sites). Sway braces, bankseat beam, end of bridge top panels and end taper panels have been removed. Because the junction panels, top panels and bottom panels are facing in the opposite direction to a normal near bank strip, they cannot be disconnected in the usual way. The drills to disconnect them are as follows:

a. Removing Junction Panel

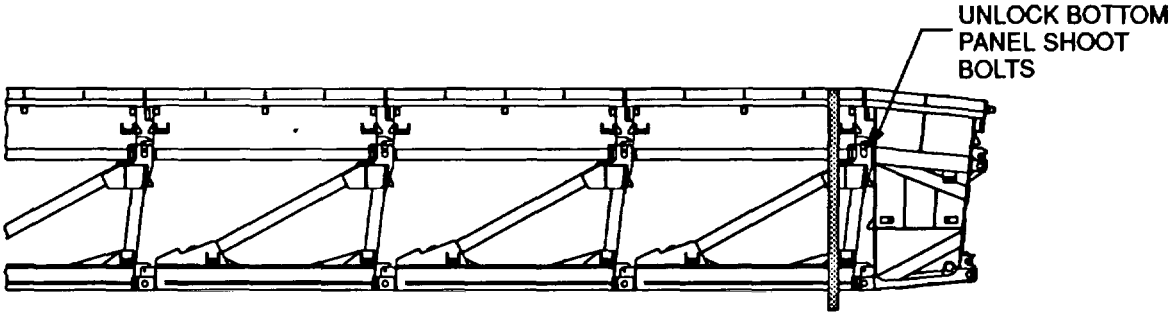
(1) Remove sway braces in the last three bays of bridge.

(2) Place one 10,000 lb cargo tie-down strap around panel point 7 of the last bay. This strap must be adjusted so as to provide 6 in (15.0 cm) of slack below bottom panel. Placement of this tie-down strap prevents the bottom panel from dropping too far when the junction panel is removed. This strap reduces the chances of injury to personnel and damaging the panel.

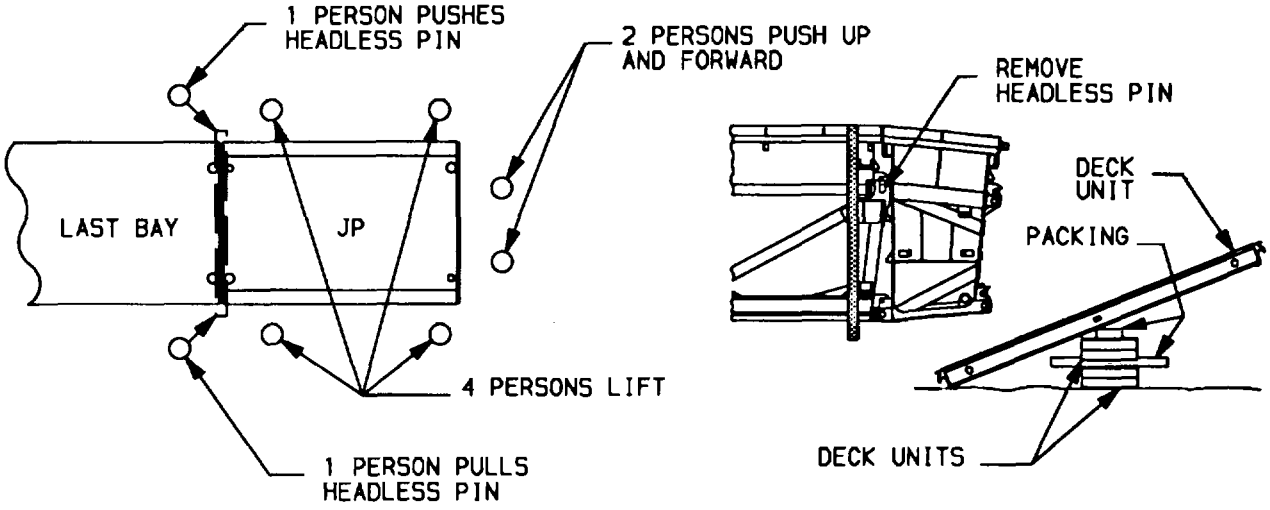


(3) Remove retainer clips from headless pin in junction panel.

(4) Unlock shoot bolts of bottom panel in last bay of bridge.



(5) Using deck units as shown lift junction panel and remove headless pin from upper pin hole in junction panel.



(6) Remove panel pin from bottom pin hole in junction panel.

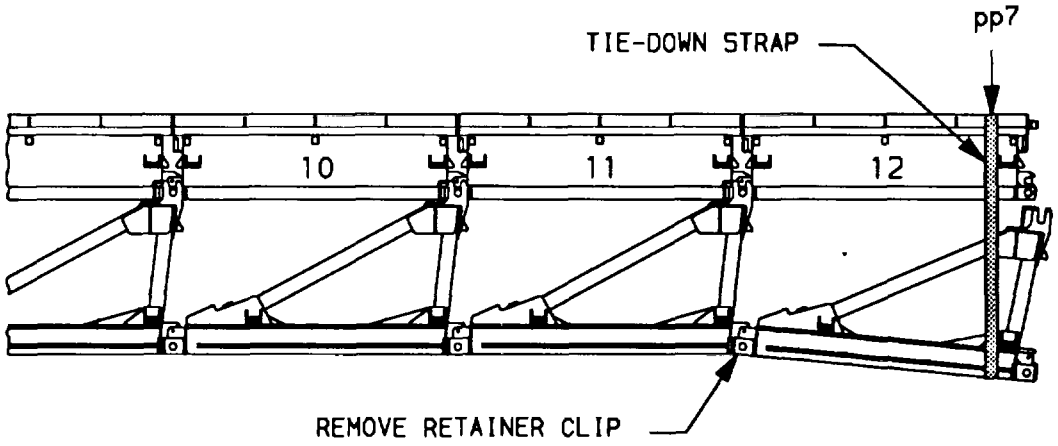
WARNING

Bottom panel will drop Into strap as junction panel Is removed. Keep feet and legs clear of bottom panel.

(7) Four personnel lift junction panel and unlock top panel shoot bolts. Remove junction panel from the end of bridge.

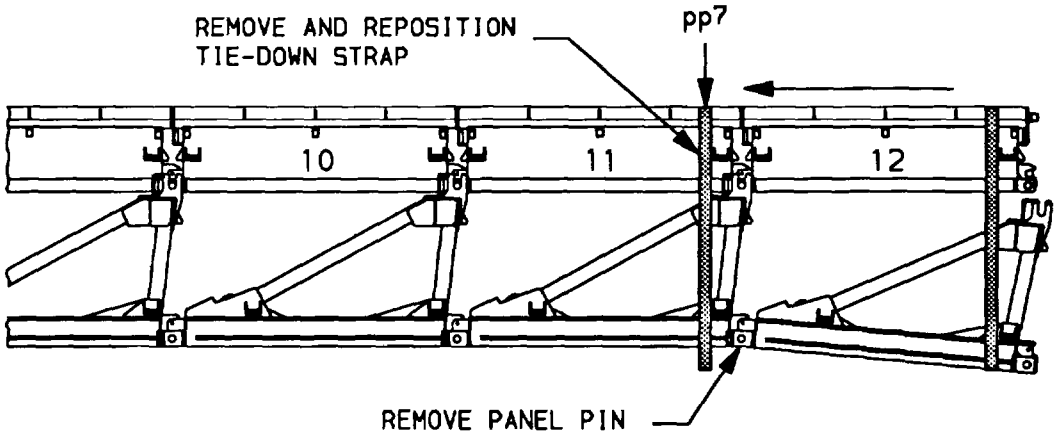
b. Removing Bottom Panels.

When the bottom panel is ready to be removed, it will be supported by a strap at panel point 7, that was positioned there prior to removing the junction panel.



(1) Remove retainer clip from panel pin in bottom panel.

(2) Four personnel lift bottom panel, while one person unhooks and removes the tie-down strap, and repositions it at panel point 7 of the next bay. Another person removes the panel pin.



(3) Move bottom panel from under top panel.

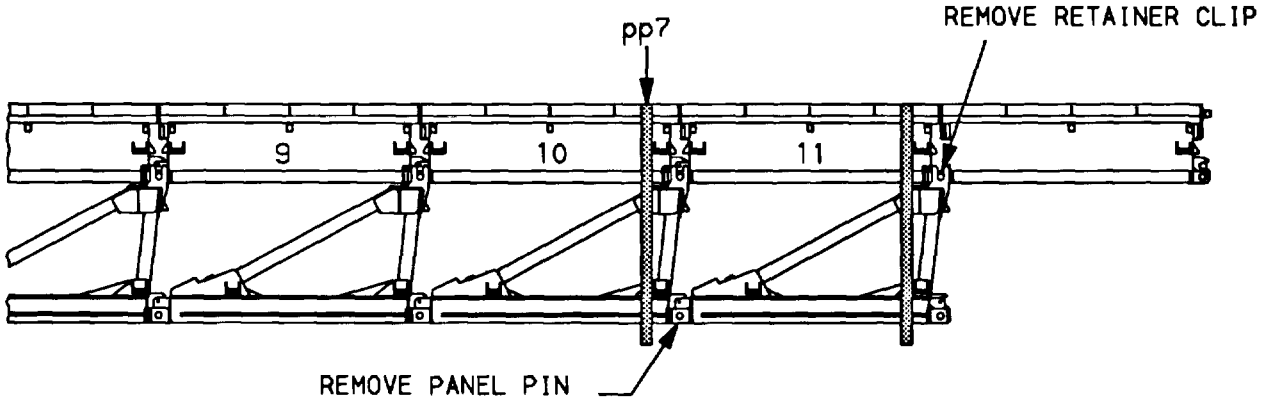
c. Removing Top Panels.

(1) Place a second tie-down strap around panel point 7 of the next unstrapped bay.

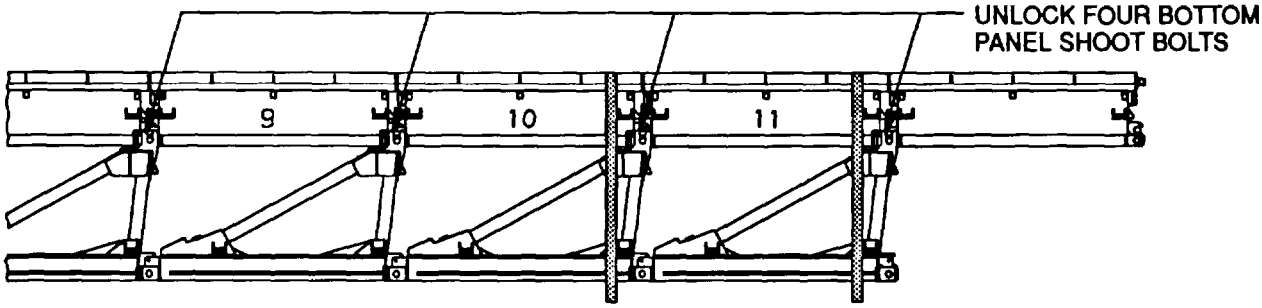
NOTE

From this point on, these two straps will be moved along the bridge girder so there are always two straps around the last two bays of bridge.

(2) Remove retainer clip from panel pin in last top panel.



(3) Unlock shoot bolts of the next four bottom panels.

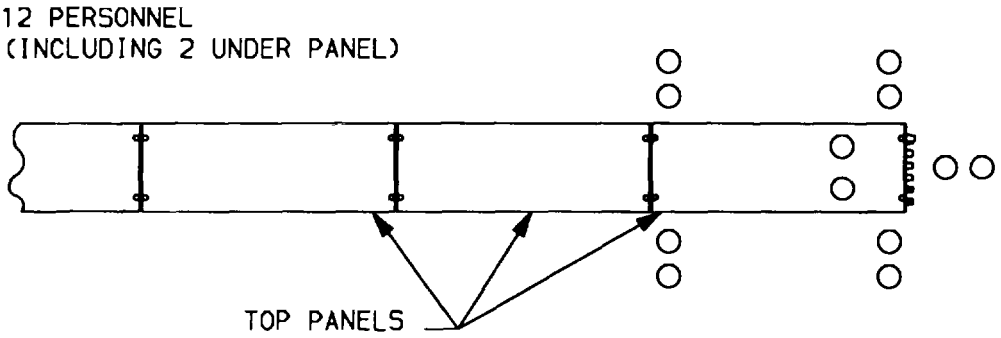


NOTE

It Is necessary to unlock four shoot bolts so as to provide enough slack In the girder to permit releasing the bottom panel upper jaws from the panel pin In the rearmost top panel. Ensure that four shoot bolts are unlocked before trying to lift the rearmost top panel.

(4) Remove the next sway brace in the bridge.

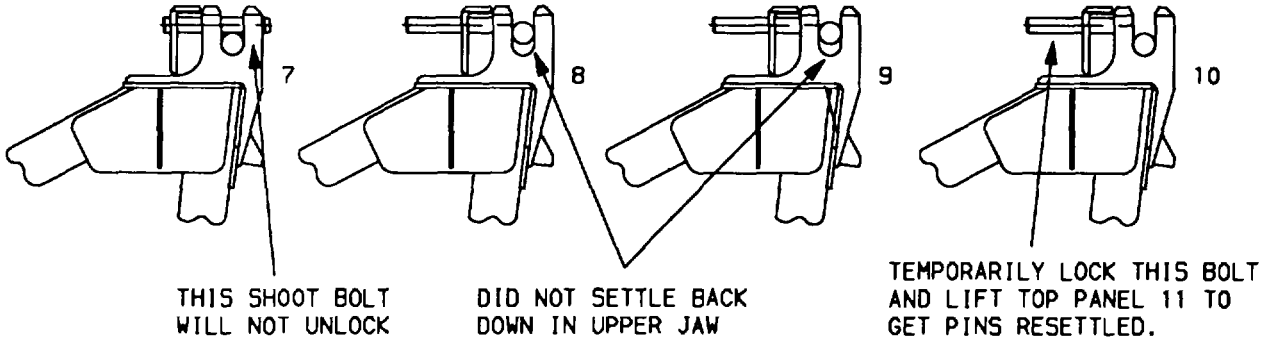
(5) Using 12 personnel (as shown), lift rearmost top panel until bottom panel falls free of panel pin in top panel.



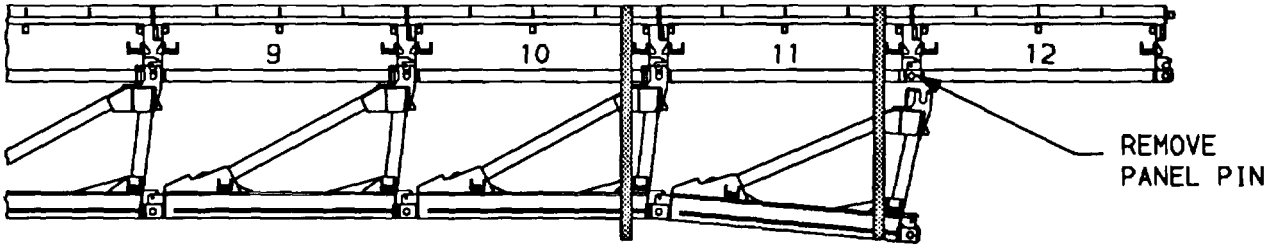
NOTE

The panel pins in the upper jaws may not settle back down after the top panel is lifted (as shown in example). If this happens it will not be possible to unlock the next shoot bolt.

To unlock the next shoot bolt (e.g. bay 7), temporarily lock the shoot bolt in bottom panel 10 and lift top panel 11 until the pins in 9 and 8 resettle. Unlock shoot bolt in bays 10 and 7.



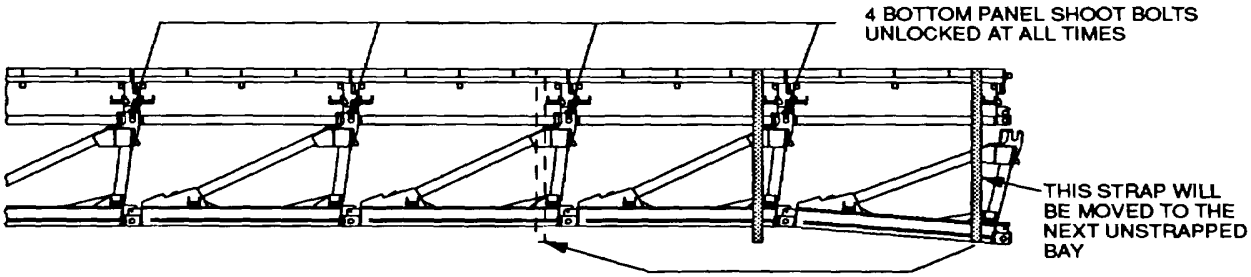
(6) Let top panel down and remove panel pin.



(7) Lift top panel, unlock shoot bolts and remove panel.

NOTE

As this top panel Is removed ensure that four bottom panel shoot bolts are unlocked. As the next bottom panel Is removed, unhook and move the tie-down strap to the next unstrapped bay.



CHAPTER 5

SINGLE STORY BRIDGE

Page

Section I. GENERAL 5-2

Section II. NORMAL SITES 5-9
5-1 ASSEMBLY - SINGLE STORY- 5 BAY 5-9
5-2 DISASSEMBLY - SINGLE STORY - 5 BAY 5-14
5-3 ASSEMBLY - SINGLE STORY - 12 BAY 5-20
5-4 DISASSEMBLY - SINGLE STORY- 12 BAY 5-27

Section III. RESTRICTED SITES 5-32
5-5 ASSEMBLY - SINGLE STORY- 12 BAY (Restricted Site) 5-32
5-6 DISASSEMBLY- SINGLE STORY- 12 BAY (Restricted Site) 5-36

Section IV. COUNTERWEIGHTS - SINGLE STORY 5-39
5-7 6 BAY - NORMAL SITE 5-39
5-8 7 BAY - NORMAL SITE 5-39
5-9 8 BAY - NORMAL SITE 5-39
5-10 9 AND 10 BAY - RESTRICTED SITE 5-40
5-11 11 AND 12 BAY- RESTRICTED SITE 5-40

Section V. OVERBRIDGES - SINGLE STORY 5-41
5-12 GENERAL 5-41
5-13 DESIGN 5-41
5-14 ASSEMBLY 5-42

Section VI. ANCHORAGE - SINGLE STORY 5-46
5-15 BASIC CONSIDERATIONS 5-46
5-16 TYPES OF ANCHORAGE 5-46
5-17 PICKET TYPE INSTALLATION 5-47
5-18 APPROACH GUY INSTALLATION 5-47

Section I. GENERAL

a. Introduction. The construction (assembly) and delaunch (disassembly) of single story bridges is described in step by step procedures in this chapter.

The assembly procedures start with the setting up and alignment of the roller beam, followed by step by step assembly instructions to construct the bridge. Similarly, disassembly procedures contain full step by step instructions. Disassembly is not the exact reverse of assembly; there are differences, therefore the step by step procedures shall be followed carefully. These procedures are covered in more detail in Chapter 4 General Drills. The operator should be familiar with these drills before following the step by step procedures in this chapter.

When familiarity is gained with the step by step procedures, any single story 4 through12 bay bridge can be assembled using the Building and Boom Tables, and disassembled using the Delaunch Tables.

NOTE

Do not attempt to use the Tables until the standard drills and the step by step procedures have been practiced a number of times.

b. Short single story bridges up to 5 bays long can be launched by vehicle and push bar or manually PUSH LAUNCHED off the roller beam. A push launch can only be performed if:-

(1) It is operationally necessary.

(2) There is no packing under roller beam baseplate.

(3) Launching nose light front removed before bridge is allowed to fall.

(4) Sufficient space is available between roller beam and landing roller.

(5) The bridge is pushed by hand and not by push bar.

(6) The final push will be strong enough for bridge to fall clear of roller beam.

(7) If the site is hard (man made) sand bags must be placed under rear bankseat beam.

TABLE 5-1. Building and Boom Table - 4 through 8 Bay Single Story (Normal site)

Bridge ft. Length m.	26 7.9	32 9.8	38 11.6	44 13.4	50 15.2
Bays	4	5	6	7	8
L/Nose	LLN	LLN	LLN	LLN	LLN
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d
Boom Add	1p2 3	1p2 3	1p2 3	1p2 3	1p2 3
Boom Add	1p7 4	1p7 4	1p7 4	1p7 4	1p7 4
Boom Add	2p3 BSB	2p3 5	2p3 5	2p3 5	2p3 5
Boom Add		2p7 BSB	2p7 6	2p7 6	2p7 6
Boom Add			3p3 BSB,[5D]	3p3 7	3p3 7
Boom Add				3p7 [8]	3p7 8
Boom Add				4p3 [BSB, 4D]	4p3 [9]
Boom Add					4p7 [10]
Boom Add					5p3 [BSB, 5D]
Launch Add	(2p7) LR^	(3p3) LR^	(4p2) LR^	(5p2) LR^	(6p2) LR^
Launch				7p7 Notes g,h	8p7 Notes g,h
Launch				Note e	Note e
Complete By	Notes e,f,i	Notes e,f,i	Notes e,g,i	Note i	Note i

NOTES:

a. Build BSB, LLN, Bay 1 and jackpost on BP and RB.
b. Boom to center hole of BSB over RB.
c. Put BP under lp7.
d. Add Bay 2 and put BP under 2p4.
e. Launch until far bank end of bridge is 9 in (23 cm) from LR or RBSB overhangs RB by 1.5 ft (0.5 m). If minimum bearing is to be used, launch to center hole in BSB.
f. Remove front section of LLN before push launch.
g. Move counterweight deck units into final position.
h. Remove counterweight panels and refit BSB from temporary counterweight position to normal position.
i. Put bridge on ground.

^ Position LR 9 in (23 cm) from F peg.
[ ] Counterweight. (Counterweight BSB connected by shootbolts only).
( ) Center of gravity.

TABLE 5-2. Building and Boom Table - 9 through 12 Bay Single Story (Normal Site)

Bridge ft Length m	56 17.1	62 18.9	68 20.7	74 22.6
Bays	9	10	11	12
L/Nose	5N1	5N1	6N1	6N1
Build Boom Add	Notes a,b,c,d 1p2 Note e,f 4,1N1* 5,2N1 6 3N1,4N1,5N1	Notes a,b,c,d 1p2 Note e,f 4,1N1* 5,2N1 6 3N1,4N1,5N1	Notes a,b,c,d 1p2 Note e,f 4,1N1* 5,2N1 6 3N1,4N1,5N1	Notes a,b,c,d 1p2 Note e,f 4,1N1* 5,2N1 6 3N1,4N1,5N1
Boom Add		1p4 7	1p4 7 + 6N1	1p4 7 + 6N1
Boom Add		2p0 8		1p5 8
Boom Add				2p1 9
Launch Position	(1p5) LRP^	(2p4) LRP^	(1p5) LRP^	(2p7) LRP^
Launch Remove Add	6p5 Notes g, h 7,8,9,BSB	8p5 Notes g, h 9,10,BSB	7p5 Notes g, h 8,9,10,11,BSB	9p5 Notes g, h 10,11,12,BSB
Launch To	Note i	Note i	Note i	Note i
Complete By	Note j	Note j	Note j	Note j

NOTES:

a. Put BSB on RB.
b. Add Bay 1 and put BP under 1p7.
c. Fit nose roller.
d. Add Bay 2 and put BP under 2p4.
e. Add Bay 3 (with headless pin) and put BP at 3p7.
f. Add LNCG posts, LNCG, nose roller and LLN.
g. Remove LLN.
h. Remove LNH sections as they pass LRP.
i. Launch until far bank end of bridge is 9 in (23 cm) from LRP or BSB overhangs RB by 1.5 ft (0.5 m). If minimum bearing is being used, launch to center hole in BSB.
j. Put bridge on the ground.

^ Position LRP 9 in (23 cm) from F peg.
( ) Center of gravity.
* Add LRP and secure with tie down strap.

TABLE 5-3. Building and Boom Table - 9 through 12 Bay Single Story (Restricted Site)

Bridge ft Length m	56 17.1	62 18.9	68 20.7	74 22.6
Bays	9	10	11	12
L/Nose	6N1	6N1	7N1	7N1
Build	Notes a thru d	Notes a thru d	Notes a thru d	Notes a thru d
Add	Notes e,f, 4 1N1*,2N1,3N1 [2TP,4D] 4N1,5N1 [BSB],6N1** LRP^	Notes e,f, 4 1N1',2N1,3N1 [2TP,4D] 4N1,5N1 [BSB],6N1** LRP^	Notes e,f, 4 1N1*,2N1,3N1 [4TP,4D] 4N1,5N1 [BSB],6N1,7N1*° LRP^	Notes e,f, 4 1N1*,2N1,3N1 [4TP,4D] 4N1,5N1 [BSB],6N1,7N1** LRP^
Remove	[2TP,4D]	[2TP,4D]	[4TP,4D]	[4TP,4D]
Boom Remove	2p7 [BSB] Note g	2p7 [BSB] Note g	2p7 [BSB] Note g	2p7 [BSB] Note g
Boom Remove Add	4p5 Note h 5,6,7,8	4p5 Note h 5,6,7,8	4p5 Note h 5,6,7,8	4p5 Note h 5,6,7,8
Boom Add	8p5 9,BSB	8p5 9,10,BSB	8p5 9,10,11,BSB	8p5 9,10,11,12,BSB
Complete By	Note i,j,k	Note i,j,k	Note i,j,k	Note i,j,k

NOTES:

a. Put BSB on RB.
b. Add Bay 1 and put BP under 1p7.
c. Fit nose roller.
d. Add Bay 2 and put BP under 2p6.
e. Add Bay 3 (with headless pin) and put BP at 3p7.
f Add LNCG posts, LNCG, nose roller and LLN.
g. Place BSB to side of site near rear of bridge.
h. Remove nose sections as they pass LRP, observing 5 ft (1.5 m) minimum overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
i. Launch until far bank end of bridge is 9 in (23 cm) from LRP or BSB overhangs RB by 1.5 ft (0.5 m). If minimum bearing is being used, launch to center hole in BSB.
j. Lower LRP, remove last 3 LNH.
k. Put Bridge on the ground.

^ Position LRP 9 in (23 cm) from F peg.
[ ] Counterweight. (Counterweight BSB connected by shootbolts only).
( ) Center of gravity.
* Add LRP and secure with tie down strap.
** Bridge will tip as nose is boomed.

TABLE 5-4. Delaunch Table 4 through 8 Bay Single Story (Normal Site)

Bridge ft. Length m.	26 7.9	32 9.8	38 11.6	44 13.4	50 15.2
Bays	4	5	6	7	
L/Nose	LLN	LLN	LLN	LLN	LLN
Build Remove Add	Notes a,b,c,d,e	Notes a,b,c,d,e	Notes a,b,c,d,e [5D]	Note a,b BSB [8, BSB, 4D] Notes c,d,e	Note a,b BSB [9,10,BSB,5D] Notes c,d,e
Delaunch Recover	(2p7) LR	(3p3) LR	(4p2) LR	(5p2) LR	(6p2) LR
Boom Remove					5p3 [BSB,5D]
Boom Remove					4p7 [10]
Boom Remove				4p3 [BSB,4D]	4p3 [9]
Boom Remove				3p7 [8]	3p7 8
Boom Remove			3p3 BSB,[5D]	3p3 7	3p3 7
Boom Remove		2p7 BSB	2p7 6	2p7 6	2p7 6
Boom Remove	2p3 BSB	2p3 5	2p3 5	2p3 5	2p3 5
Boom Remove	1p7 4	1p7 4	p7 4	1p7 4	1p7 4
Boom Remove	1p2 Note f 3	1p2 Note f 3	1p2 Note f 3	1p2 Note f 3	1p2 Note f 3
Boom Remove	BSB Note g 2	BSB Note g 2	BSB Note g 2	BSB Note g 2	BSB Note g 2
Boom Remove	Note h 1	Note h 1	Note h 1	Note h 1	Note h 1
Complete By	Notes i, j	Notes i, j	Notes i, j	Notes i, j	Notes i, j

NOTES:

a. Remove curbs, deck units and ramps.
b. Install rb under bridge min 1.5 ft (0.5m) from the end. If minimum bearing is being used, position RB under center hole in BSB.
c. Add LLN.
d. Install LR 9 in (23 cm) from BSB.
e. Put BP as required to keep bridge off the ground.
f. Move BP to 2p7.
g. Move BP to 1p7.
h. BSB over BP.
i. Remove LLN.
j. Remove BSB. Clear site..
[ ] Counterweight. (Counterweight BSB connected by shootbolts only).
( ) Center of gravity.

TABLE 5-5. Delaunch Table - 9 through 12 Bay Single Story (Normal Site)

Bridge ft Length m	56 17.1	62 18.9	68 20.7	74 22.6
Bays	9	10	11	12
L/Nose	5N1	5N1	6N1	6N1
Build	Notes a thru e	Notes a thru e	Notes a thru e	Notes a thru e
Delaunch Remove Add	6p5 BSB,9,8,7 Note f	8p5 BSB,10,9 Note f	7p5 BSB,11,10,9,8 Note g	9p5 BSB,12,11,10 Note g
Delaunch Recover	(1p5) LRP	(2p4) LRP	(1p5) LRP	(2p7) LRP
Boom Remove		2p0 8		2p1 9
Boom Remove				1p5 8
Boom Remove		1p4 7	1p4 6N1,7	1p4 6N1,7
Boom Remove	1p2 5N1,4N1,3N1 6 2N1,5 1N1, LLN 4 Note h 3	1p2 5N1,4N1,3N1 6 2N1,5 1N1, LLN 4 Note h 3	1p2 5N1,4N1,3N1 6 2N1,5 1N1,LLN 4 Note h 3	1p2 5N1,4N1,3N1 6 2N1,5 1N1,LLN 4 Note h 3
Boom Remove	BSB Note i 2,1	BSB Note i 2,1	BSB Note i 2,1	BSB Note i 2,1
Complete By	Note j	Note j	Note j	Note j

NOTES:

a. Remove curbs, deck units and ramps.
b. Install RB under bridge minimum 1.5 ft (0.5m) from end. If minimum bearing is being used, position RB under center hole of BSB.
c. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
d. Position BP as required to keep bridge off ground.
e. Add LNCG posts, LNCG, nose roller and 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB]. Add LNH 4.
f. Add LNH5 and LLN.
g. Add LNH5, LNH6 and LLN.
h. Move BP to 2p7. Remove nose roller, LNCG and LNCG posts.
i. Move BP to lp7
j. Remove BSB. Clear site.
( ) Center of gravity.

TABLE 5-6. Delaunch Table - 9 through 12 Bay Single Story (Restricted Site)

Bridge ft Length m	56 17.1	62 18.9	68 20.7	74 22.6
Bays	9	10	11	12
L/Nose	6N1	6N1	7N1	7N1
Build	Notes a thru d	Notes a thru d	Notes a thru d	Notes a thru d
Delaunch Remove Add	8p5 BSB Note e 9 Note f	8p5 BSB Note e 10,9 Note f	8p5 BSB Note e 11,10,9 Note f	8p5 BSB Note e 12,11,10,9 Note f
Delaunch Remove Add	4p5 8,7,6,5 [BSB]	4p5 8,7,6,5 [BSB]	4p5 8,7,6,5 [BSB]	4p5 8,7,6,5 [BSB]
Delaunch Add Recover Remove Complete By	1pO Note g, [2TP,4D] LRP 6N1,BSB, 5N1,4N1 [2TP,4D] 3N1,2N1,1N1 4,LLN 3,2,1 Note h	1pO Note g, [2TP,4DJ LRP 6N1,BSB, 5N1,4N1 [2TP,4D] 3N1,2N1,1N1 4,LLN 3,2,1 Note h	1pO Note g, [4TP,4D] LRP 7N1,6N1,BSB, 5N1,4N1 [4TP,4D] 3N1,2N1,1N1 4,LLN 3,2,1 Note h	1p0 Note g, [4TP,4D] LRP 7N1,6N1,BSB, 5N1,4N1 14TP,4D) 3N1,2N1,1N1 4,LLN 3,2,1 Note h

NOTES:

a. Remove curbs, deck units and ramps.
b. Install RB under bridge minimum 1.5 ft (0.5 m) from end. If minimum bearing is being used, position RB under center hole of BSB.
c. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
d. Add LNCG posts, LNCG, nose roller and 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB]. Add LNH 4.
e. Place BSB to side of site near end of bridge.
f. Add launching nose sections as required, observing minimum 5 ft (1.5 m) overhang.
g. Position BP as required to keep bridge off ground.
h. Remove BSB, clear site.
[ ] Counterweight. (Counterweight BSB connected by shootbolts only).
( ) Center of gravity.

Section II. NORMAL SITES

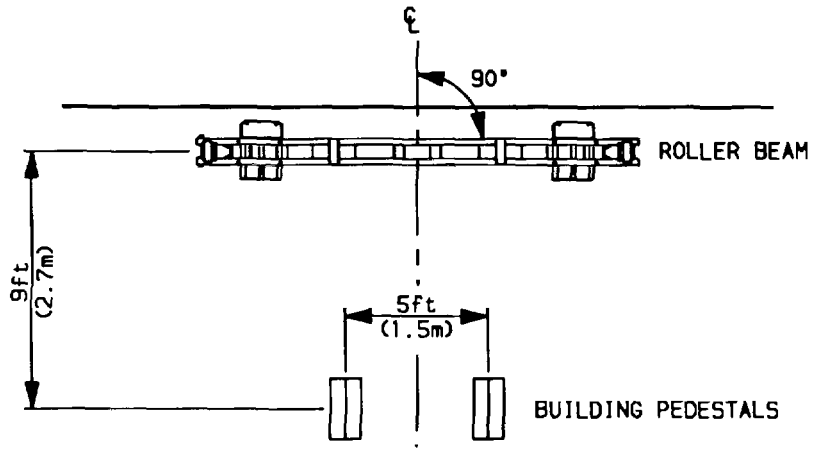
5-1. ASSEMBLY - SINGLE STORY - 5 BAY

a. Set Up and Align Roller Beam

(1) Place roller beam assembly on RB peg, centered over the peg and at 900 to bridge centerline (para. 4-5a.).

(2) Lock rollers.

(3) Place building pedestals in position 9 ft (2.7 m) behind roller beam, no more than 5ft (1.5 m) apart, with their long side parallel to the centerline.



b. Assembly

(1) Place bankseat beam (BSB) on building pedestals. Ensure that center of bankseat beam is placed over bridge centerline.

(2) Assemble launching nose (para. 4-12a). Let launching nose rest on center rollers of roller beam, supported by one person, until step (5) is complete.

(3) Fit one jack post to outer bracket on bankseat beam (para. 4-20c.), wedge up, jack post hooked on bankseat beam rail while bridge is being boomed.

NOTE

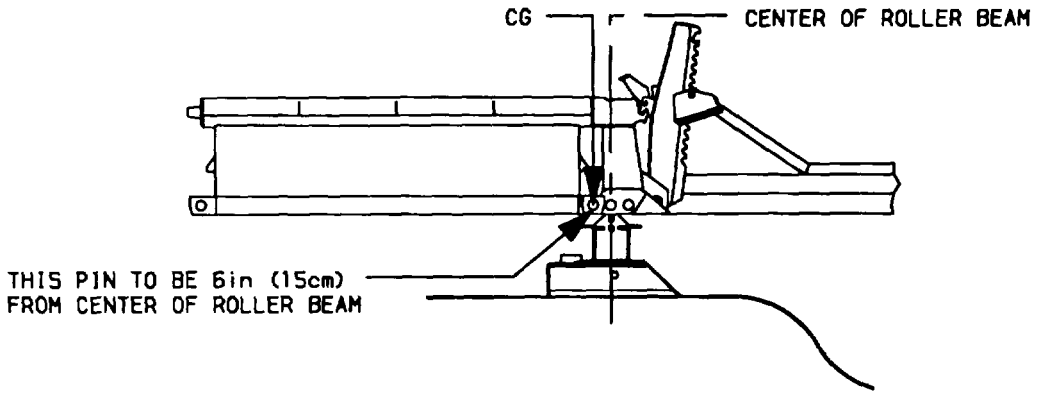
For ease of construction, the next step must be performed simultaneously by both panel crews.

(4) Connect first top panels to bankseat beam (bay 1). Do not let go of top panels (para. 4-6a.).

(5) Lift bankseat beam and top panels above building pedestals, then push forward until bankseat beam is on rollers.

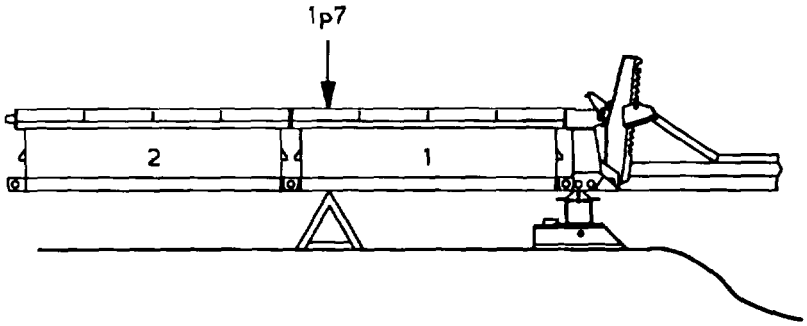
NOTE

The center of gravity (CG) of the bridge is now at the panel pin connection the top panel and bankseat beam. Keep the CG 6 in (15cm) from the center of the roller beam.

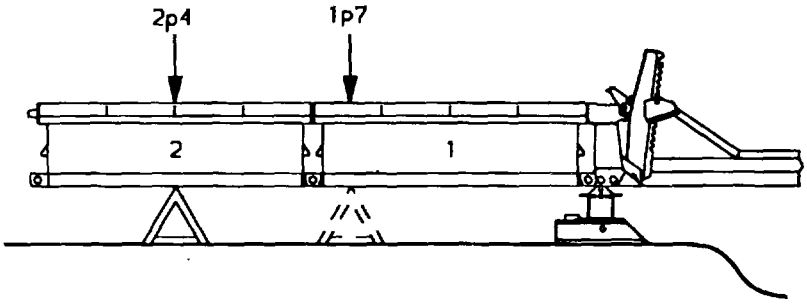


(6) NCOIC places building pedestals under rear of bay 1 at panel point 1p7.

(7) Add bay 2.



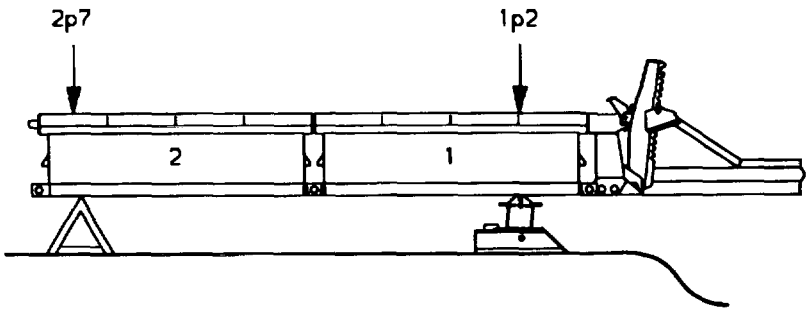
(8) Lift girders and move building pedestals under middle of bay 2 to panel point 2p4.



NOTE

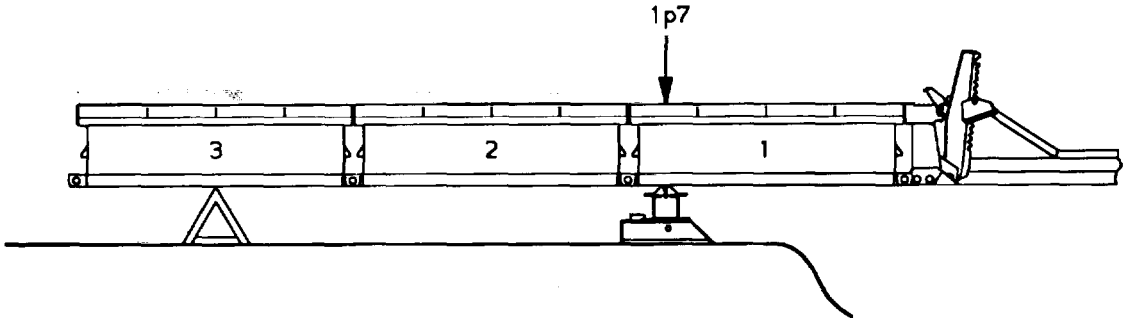
The building pedestals are now in their final position therefore no further movement of pedestals is required.

(9) Unlock roller beam rollers, lift girders and boom bridge forward until panel point lp2 is over roller beam rollers; lock rollers. Building pedestals are now under 2p7.



(10) Add bay 3.

(11) Unlock rollers and boom bridge forward until panel point 1p7 is over rollers; lock rollers.



(12) Add bay 4.

(13) Unlock rollers and boom bridge forward until panel point 2p3 is over rollers; lock rollers.

(14) Add bay 5.

(15) Unlock rollers and boom bridge forward until panel point 2p7 is over rollers; lock rollers.

(16) Fit rear bankseat beam to top panels (para. 4-9a).

(17) Unlock rollers and boom bridge four panel points to 3p3; lock rollers.

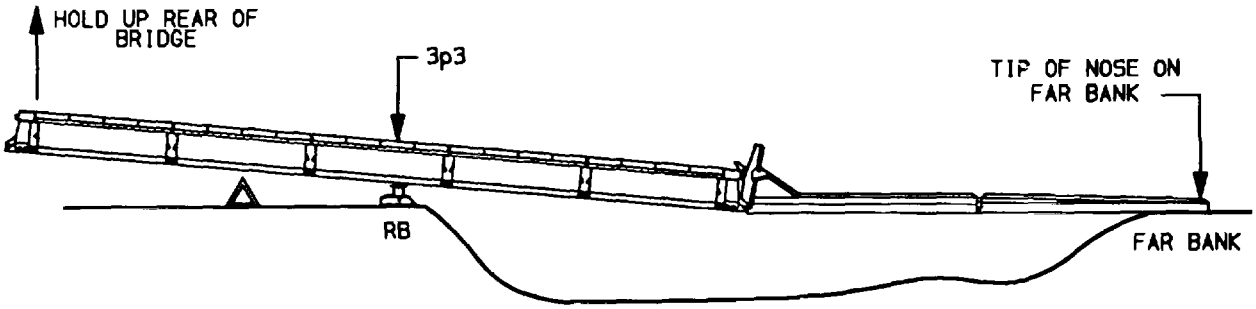
NOTE

At panel point 3p3, the bridge Is positioned with its center of gravity (CG) over the roller beam.

(18) To set up landing roller under launching nose.

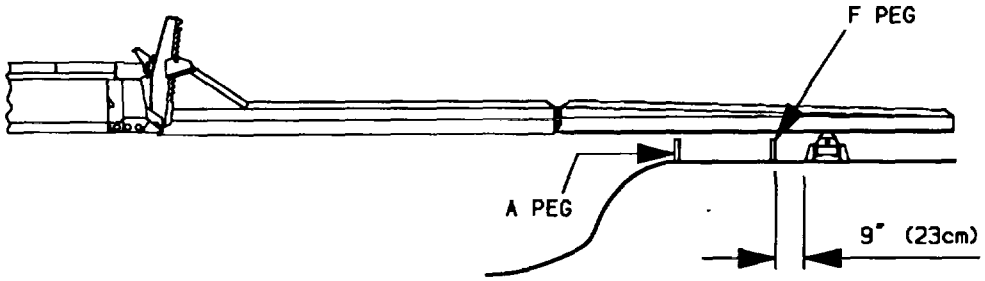
(a) Lift rear of bridge until launching nose rests on far bank, and hold in this position.

(b) Two personnel shall carry landing roller, jack, jack handle and one piece of packing (3 in x 8 in x 36 in) across bridge to far bank.

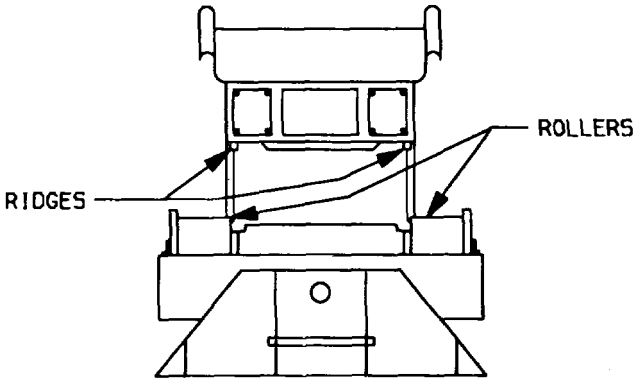


(c) Lower rear end of bridge to allow landing roller to be placed under launching nose.

(d) Position landing roller under launching nose with the edge of landing roller 9 in (23 cm) from F peg.



(e) Carefully let nose down onto landing roller. Ensure that nose sits in rollers and that landing roller is positioned squarely under nose. Person on far bank bears down (standing to one side) on tip of nose section to hold nose down.



(19) Unlock rollers and slowly launch bridge until far bank end of bridge is 9 in (23 cm) from landing roller. Stop launch, lock rollers. The near bank end of bridge should be 1.5 ft (0.5 m) or greater from roller beam rollers, or if minimum bearing is being used, rollers will be under center hole of bankseat beam.

(20) Remove light nose front section.

NOTE

If the bridge is to be push launched follow steps (21), and (22) and continue. For a jack launch proceed to step (23). For a push launch ensure that all conditions for a push launch have been met. (Chapter 5 section 1 para. b).

WARNING

Bridge Is pushed off roller beam by hand - DO NOT USE CARRYING BARS. Push from the rear only. Keep personnel away from the sides of the bridge.

(21) Unlock roller beam rollers and push bridge off rollers onto the ground.

(22) Remove roller beam, supports and baseplates.

NOTE

If push launch was carried out proceed to step (25).

(23) Change position of jack post wedge (to down position), (para. 4-20c.).

(24) Jack down bridge (para. 4-20e.).

(25) If approach surface is to be improved, do so at this time.

(26) Hook seven short or long ramp units to near bankseat beam. Ensure anti-lift lugs are engaged (para. 4-24).

(27) Lay decking, starting on near bank end of bridge (para. 4-25).

(28) If exit surface is to be improved, do so at this time.

(29) Hook seven short or long ramps to far bankseat beam. Ensure anti lift-lugs are engaged.

(30) Fit curbs, starting on near bank end of bridge (para. 4-26).

(31) Put bridge guide markers in place (para. 4-26).

(32) After bridge has passed inspection, put bridge classification signs in place.

(33) Make sure all erection equipment is away from roadway. The bridge is now ready for use.

5-2. DISASSEMBLY - SINGLE STORY - 5 BAY

This paragraph provides the steps necessary to disassemble the Single Story - 5 Bay - MGB on the original near bank. The bridge can be disassembled on the original far bank or near bank. If the bridge is to be disassembled on the far bank, the erection equipment and launching nose parts must change sides.

a. Preparation for Disassembly

(1) If pumps, hoses and water are available, bridge and erection components should be washed before loading them onto pallets.

(2) If washing is not possible, the parts are loaded directly onto the proper pallet.

b. Disassembly

(1) Remove bridge classification signs.

(2) Remove bridge guide markers (reverse of para. 4-26).

(3) Remove all curbs (reverse of para. 4-26).

(4) Remove ramp units on far bank, removing center ramp first (reverse of para. 4-24).

(5) Remove all deck units. Start on far bank end of bridge (reverse of para. 4-25).

(6) Remove ramp units on near bank, removing center ramp first (reverse of para. 4-24).

WARNING

The near bank end of bridge Is always raised and placed on a roller beam BEFORE the far bank end Is raised.

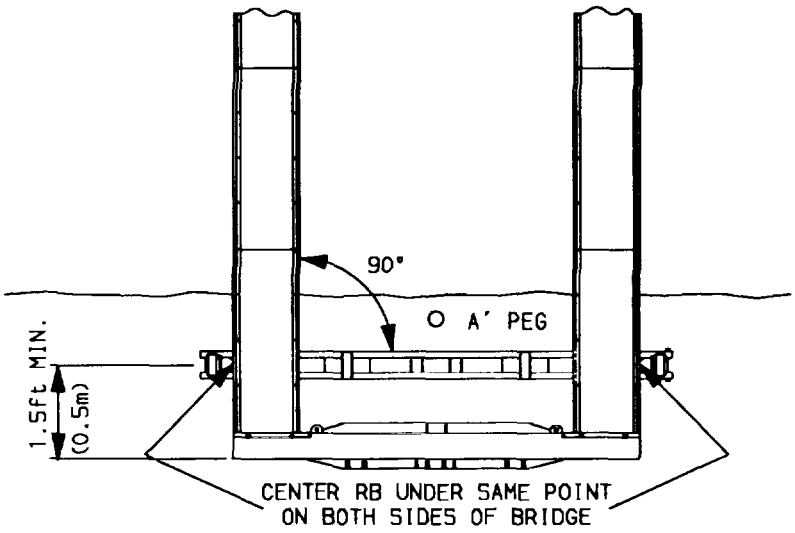
(7) Jack up near bank end of bridge high enough to slide assembled roller beam under. Place packing under girders as close to edge of gap as possible while bridge is being raised.

(8) Lower bridge onto packing, remove jacks, and slide roller beam under end of bridge minimum 1.5 ft (0.5 m) from end. If minimum bearing is being used, position roller beam undercenter hole of bankseat beam.

(a) Ensure that roller beam is centered under bridge.

(b) Ensure that roller beam is positioned at a right angle (900) to bridge.

(c) Ensure that roller beam rollers are locked.



(9) Use jacks to lower bridge onto roller beam, removing packing one layer at a time until bridge is on roller beam.

(10) Take one jack, jack post, jack handle, launching nose pin and one piece of packing to far bank.

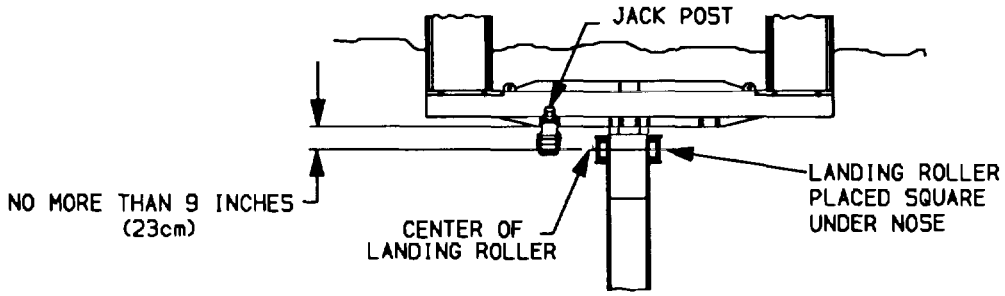
NOTE

If possible, the light launching nose should be connected to the bankseat beam before raising the bridge.

(11) Connect rear of light launching nose to bankseat beam, then connect light nose front to light nose rear (para. 4-12a).

(12) Connect jack post to outer bracket on bankseat beam (para. 4-20c.) and jack up far bank end of bridge high enough to slide landing roller under rear of launching nose.

(13) Position landing roller squarely under launching nose, with center of landing roller no more than 9 in (23 cm) from edge of bankseat beam.

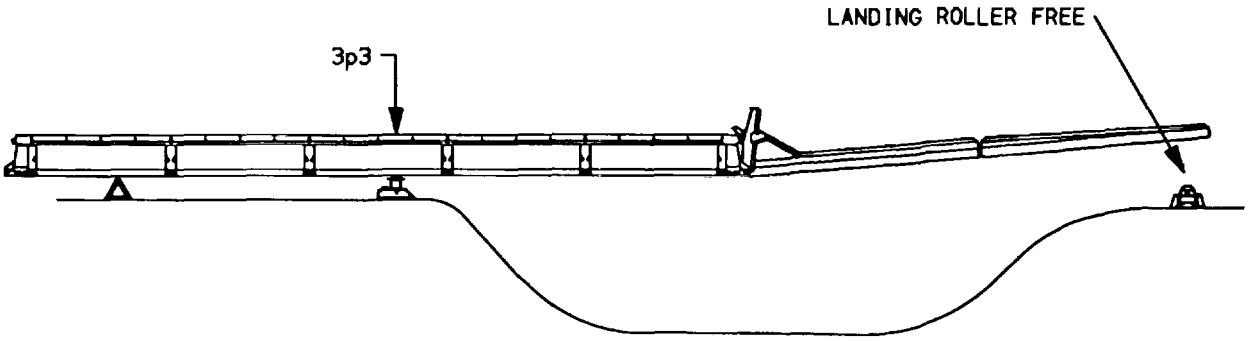


(14) Operate jack to lower launching nose onto landing roller. Ensure that ridges on nose fit between rollers. One person remains on far bank ready for step (18).

(15) On near bank, position building pedastals 12ft from the roller beam in line with bridge girders.

(16) Unlock rollers, delaunch bridge to panel point 3p3, and lock rollers. CG of bridge is now over roller beam.

(17) Lower rear of bridge, under control, to lift launching nose off landing roller.

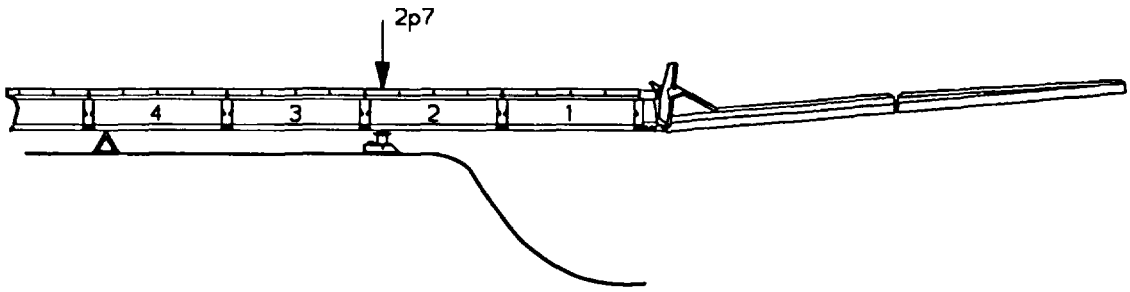


(18) Remove landing roller, lift reproof bridge under control until the nose touches the far bank, and return landing roller, jack and packing to near bank.

(19) Lower rear of bridge, unlock rollers and boom bridge away from gap to panel point 2p7. Lock rollers.

NOTE

Reposition building pedestals as necessary to bring both girders on same horizontal plane. This may also be necessary during removal of top panels.



(20) Remove bankseat beam

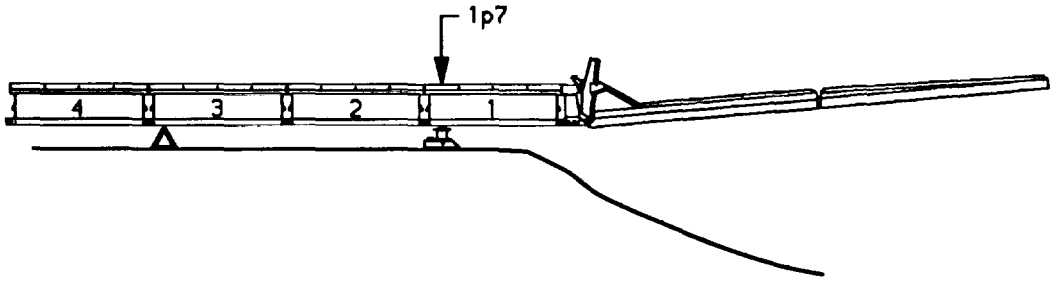
NOTE

Removal of the panel pins can be made easier by checking the level and squareness of the bankseat beam with the top panels. Check for gaps between butting surfaces of top panel and bankseat beam. Use 6 personnel, 3 personnel lifting on the inside and 3 personnel on the outside, to lift and twist the guide slots into the compression bushings.

(21) Unlock rollers and boom bridge to panel point 2p3; lock rollers.

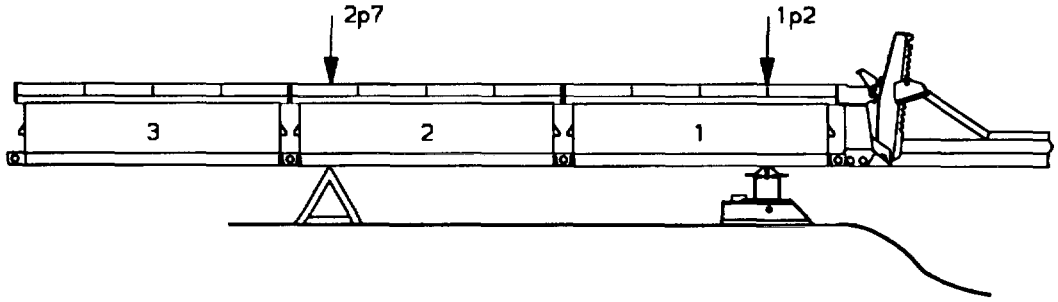
(22) Remove bay 5.

(23) Unlock rollers and boom bridge to panel point lp7; lock rollers.



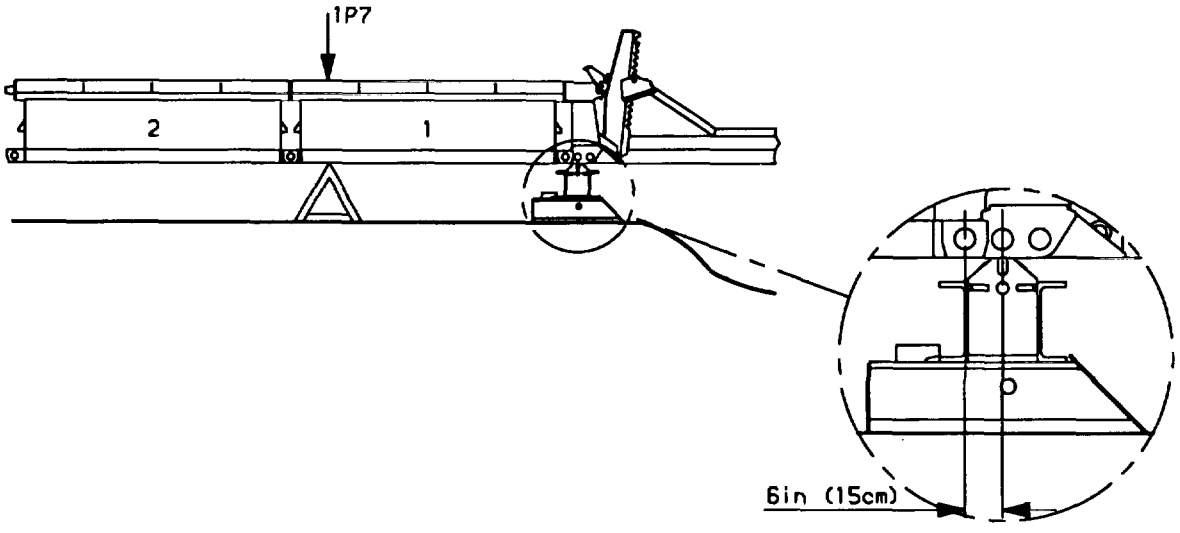
(24) Remove bay 4.

(25) Unlock rollers, boom bridge to panel point 1p2, then lock rollers. Position building pedestals under panel point 2p7.



(26) Remove bay 3.

(27) Unlock rollers, boom bridge until bankseat beam is over roller beam, then lock rollers. Ensure that panel pin connecting bankseat beam and top panel is 6 in (15 cm) from center of roller beam. Position building pedestals under panel point 1p7.

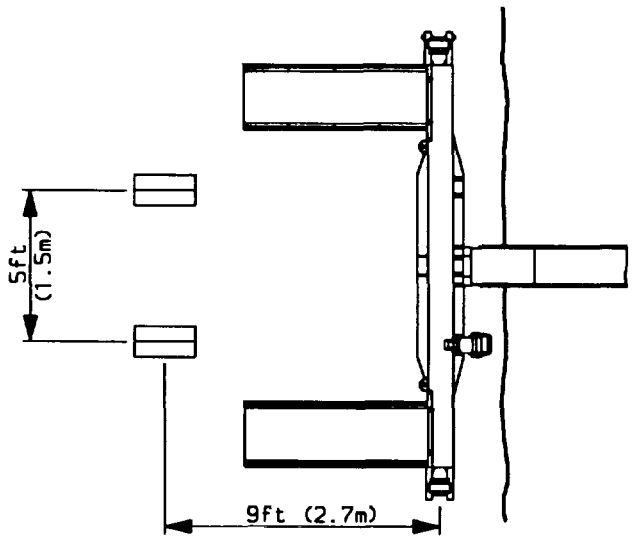


(28) Remove bay 2.

(29) To disassemble end of bridge.

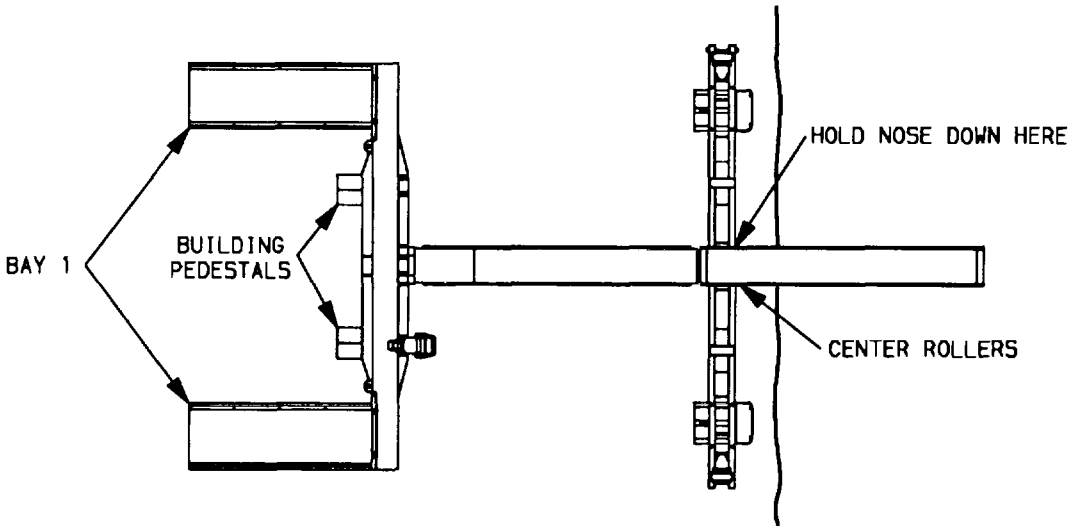
(a) Unlock rollers, lift bay 1 clear of building pedestals and position building pedestals with their tops about 5 ft (1.5 m) apart, at a point 9 ft (2.7 m) from center of roller beam.

(b) Carry entire end of bridge away from gap with launching nose sections riding on center rollers of roller beam.



(c) Stop movement of bridge when bankseat beam is over building pedestals, then lower bankseat beam onto pedestals. DO NOT let top panels down.

(d) The NCOIC of work party shall hold launching nose down on center rollers of roller beam while bay 1 top panels are removed.



(30) Remove bay 1.

(31) Remove launching nose and jack post from bankseat beam.

(32) Remove bankseat beam from building pedestals.

(33) Disassemble roller beam.

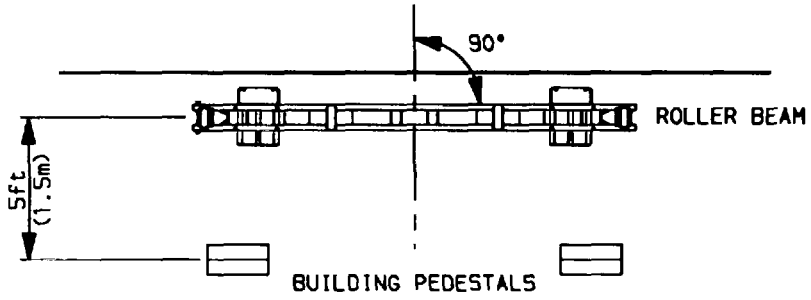
(34) Remove all components from site.

5-3. ASSEMBLY - SINGLE STORY - 12 BAY

a. Set Up and Align Roller Beam

(1) Place roller beam assembly on RB peg, centered over the peg and at 90° to bridge centerline (para.4-5a.).

(2) Place building pedestals in position 5 ft (1.5 m) behind roller beam, ready for step b.(3). Place building pedestals with their long side parallel to roller beam, in line with the roller beam outer rollers.



b Assembly

(1) Place bankseat beam on roller beam.

(a) Ensure rollers are locked.

(b) Bankseat beam must be steadied and held on top of roller beam by at least two men.

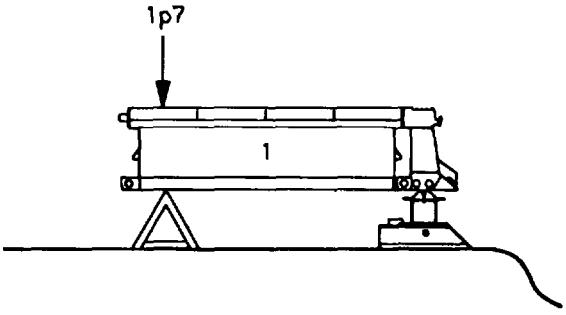
(c) Ensure that bankseat beam is centered over roller beam.

NOTE

For ease of construction, the next step must be performed simultaneously by both panel crews.

(2) Connect first top panels to bankseat beam (bay 1).

(3) Position building pedestals under rear of bay 1 at 1p7.



(4) Connect nose roller to bankseat beam (para. 4-10).

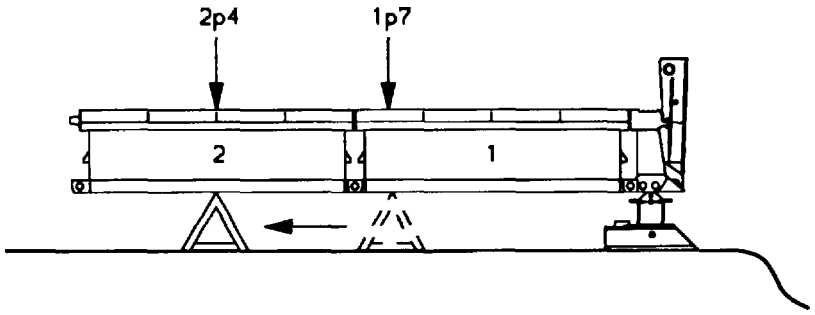
(5) Position extended jack in landing roller pedestal, and place closed landing roller pedestal and landing roller in front of roller beam and clear of building line.

NOTE

The landing roller pedestal Is used when constructing 9 through 12 bay single story bridges.

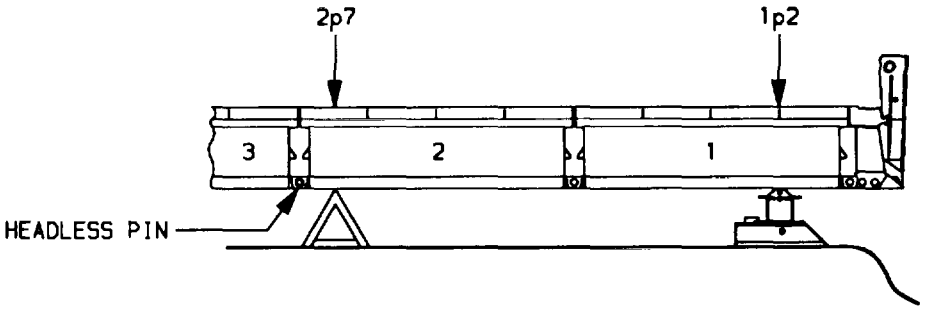
(6) Add bay 2

(7) Lift girders and move pedestals to panel point 2p4.

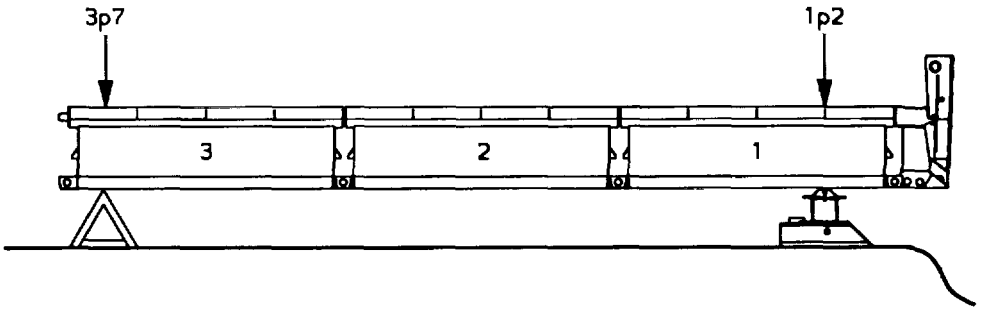


(8) Unlock rollers. Lift girders and boom bridge forward until panel point 1p2 is over roller beam rollers; lock rollers.

(9) Connect top panels of bay 3 to top panels of bay 2, using a headless panel pin. This pin is required for connection of launching nose cross girder post.



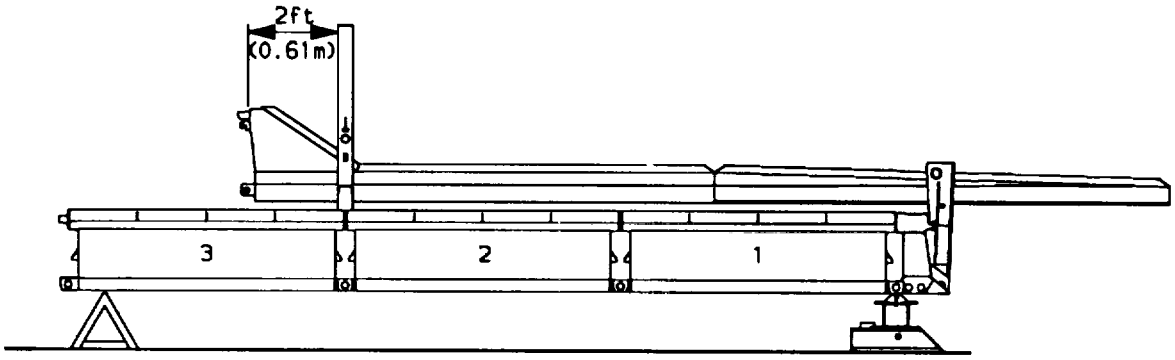
(10) Lift girders and move pedestals to panel point 3p7. Building pedestals are now in their final position and require no further movement.



(11) Fit launching nose cross girder posts to headless pins at junction of bays 2 and 3 (para. 4-11a.).

(12) Fit launching nose cross girder to posts at correct height (para. 4-11c.).

(13) Connect front and rear sections of light nose together and place front end of light nose section on nose roller and rear end on nose cross girder. Rear of nose section should extend about 2 ft (0.61 m) behind cross girder [para. 4-12b. steps (1) to (4)].

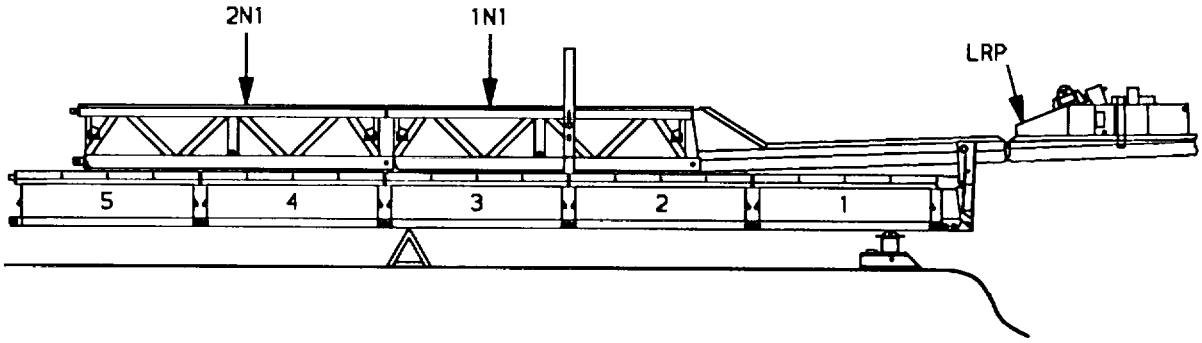


(14) Add bay 4.

(15) Add first heavy nose and landing roller pedestal assembly [para. 4-12b steps (5) to (9)].

(16) Add bay 5.

(17) Add second heavy nose section (2N1) [para. 4-12b. steps (10) and (11)].

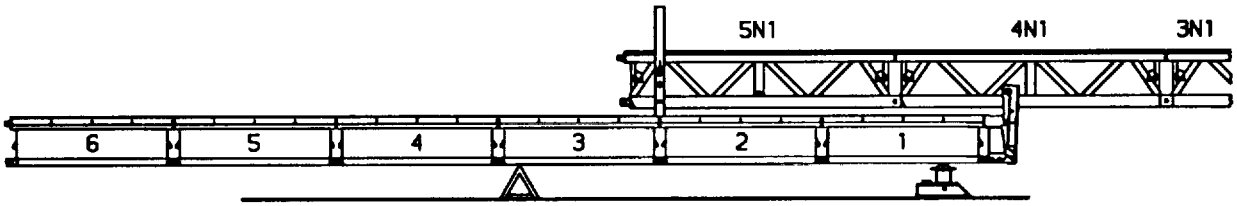


WARNING

Do not remove panel pin until another nose section is attached, and the nose crew has hands on the nose to prevent it from rolling.

(18) Add bay 6.

(19) Add third, fourth and fifth nose sections (3N1, 4N1 & 5N1) booming nose forward and securing with panel pin each time [para. 4-12b. step (12)].



(20) Unlock rollers and boom bridge forward until panel point lp4 is over rollers; lock rollers.

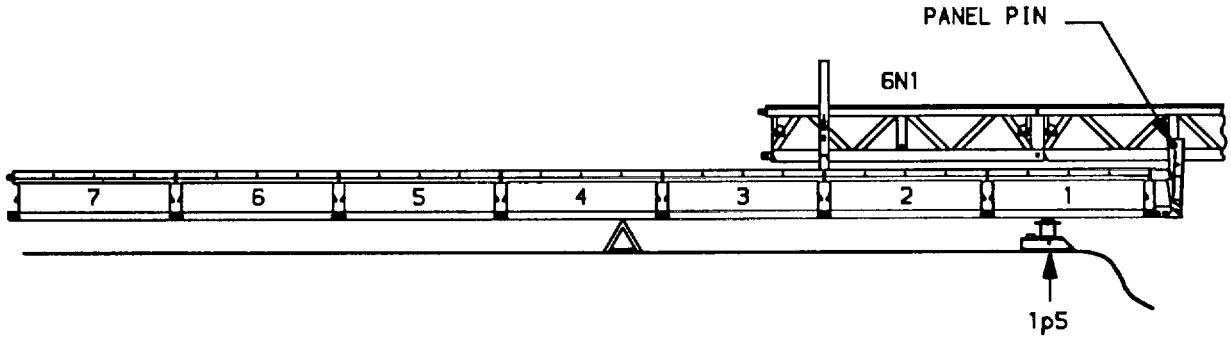
NOTE

If rear of bridge is on the ground, reposition building pedestals to assist in adding further bays.

(21) Add bay7.

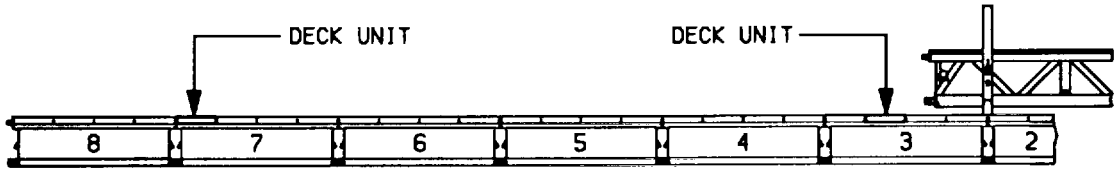
(22) Add sixth nose section (6N1), boom nose forward and secure with panel pin through nose roller and anchorage tube in 5N1.

(23) Unlock rollers and boom the bridge forward until panel point lp5 is over the rollers; lock rollers.



(24) Add bay 8.

(25) Place one deck unit in bay 3 at deck position 3 close to nose, and another at the rear of bay 7 at deck position 4.



(26) Unlock rollers and boom bridge forward until panel point 2pl is over rollers; lock rollers.

(27) Add bay 9.

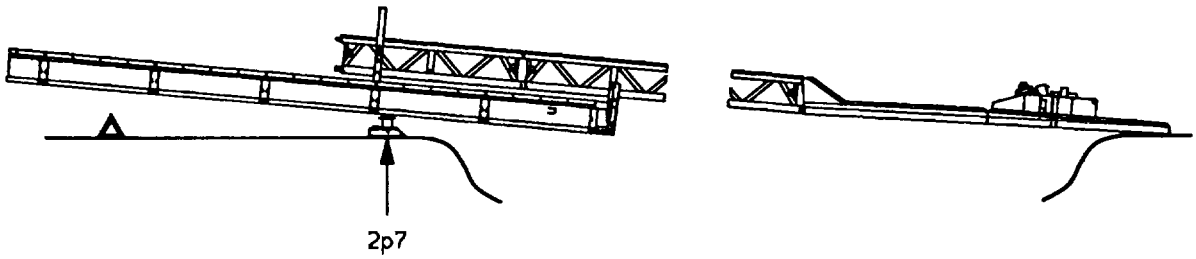
CAUTION

From this step every boom is performed using a vehicle (para. 4-18). The following cautions must be observed each time the bridge is boomed. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beam.

(28) Unlock rollers.

(29) Using vehicle launch bridge to panel point 2p7 (over RB). Note CG is at 2p7.

(30) Set up landing roller pedestal (para. 4-15a.).



NOTE

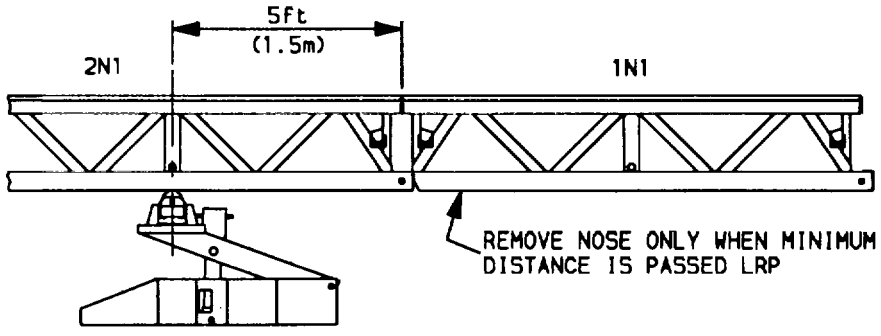
Far bank crew guides launching nose onto roller and holds nose down on roller during next step. Site conditions may determine that noses have to be removed during next boom. If so see steps (32) and (33).

(31) Continue launch until end of last top panels are 3 panel points (9p5) from the center of the roller beam. Stop launch, lock rollers.

(32) Remove both sections of light launching nose.

NOTE

Before removing a heavy nose section, the adjoining section shall extend a minimum of [5 ft (1.5 m)] beyond the center of the landing roller.



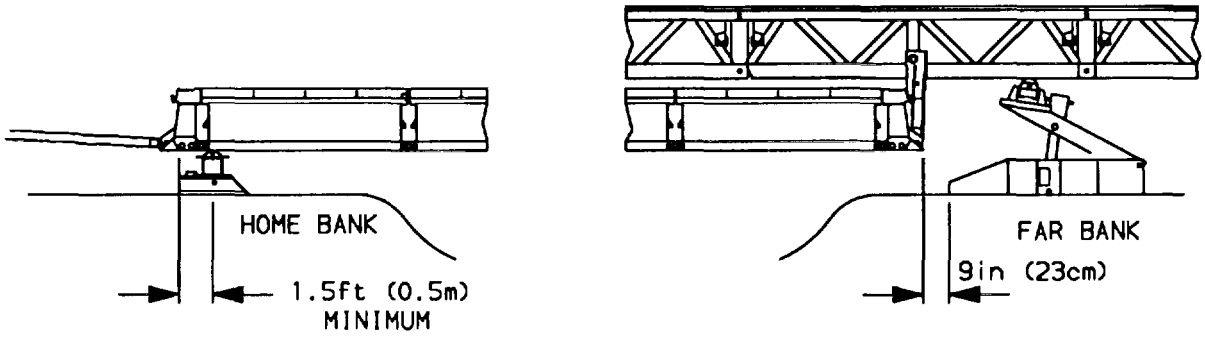
(33) Remove launching nose heavy section 1 N1 as it passes landing roller.

(34) Remove push bar and push bar cross girder.

(35) Add bays 10,11 and 12. Insert a headless pin between bays 10 and 11 in case the bridge is to be disassembled on the far bank.

(36) Connect rear bankseat beam. It may be necessary to level and square bridge girders so that the bankseat beam will connect (para. 4-9a.).

(37) Unlock rollers. Using vehicle launch bridge until the front bankseat beam is within 9 in (23 cm) of landing roller pedestal. Stop launch, lock rollers. The near bank end of bridge should be 1.5 ft (0.5 m) or greater from the roller beam rollers, or if minimum bearing is being used, rollers will be under center hole in bankseat beam.

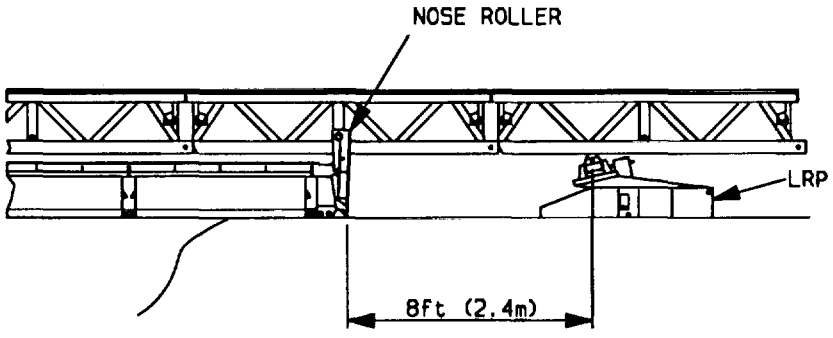


WARNING

Carelessness and improper operation of the hydraulic jack in the landing roller pedestal may result In serious injury to personnel.

(38) Lower far bank end of bridge by operating jack in landing roller pedestal.

(39) Reposition landing roller pedestal so that center of roller is 8 ft (2.4 m) from nose roller on bankseat beam, then raise landing roller pedestal until roller touches bottom of launching nose.



(40) Remove launching nose heavy sections [para. 4-13a. steps (4) to (9)].

(41) Remove launching nose cross girder and posts; use 6 personnel [para. 4-11a. step (7)].

(42) Disconnect vehicle from bridge.

(43) Jack down bridge onto near bank (para. 4-20f.)

(44) If approach surface is to be improved, do so at this time.

(45) Hook seven short or long ramp units to near bankseat beam. Ensure anti-lift lugs are engaged (para. 4-24).

(46) Lay decking, starting on near bank end of bridge (para. 4-25).

(47) If exit surface is to be improved, do so at this time.

(48) Hook seven short or long ramps to far bankseat beam. Ensure anti lift-lugs are engaged.

(49) Fit curbs, starting on near bank end of bridge (para. 4-26).

(50) Put bridge guide markers in place (para. 4-26).

(51) After bridge has passed inspection, put bridge classification signs in place.

(52) Make sure all erection equipment is away from roadway. The bridge is now ready for use.

5-4. DISASSEMBLY - SINGLE STORY -12 BAY

This paragraph provides the steps to disassemble the Single Story 12 Bay MGB on the original near bank. The bridge can be disassembled on the original far bank or near bank. If the bridge is to be disassembled on the far bank, the erection equipment and launching nose parts must change sides.

a. Preparation for Disassembly

(1) If pumps, hoses and water are available, the bridge and erection components should be washed before loading them on pallets.

(2) If washing is not possible, the parts are loaded directly onto the proper pallet.

b. Disassembly

(1) Remove bridge classification signs.

(2) Remove bridge guide markers (reverse of para. 4-26).

(3) Remove all curbs (reverse of para. 4-26).

(4) Remove ramp units on far bank, removing center ramp first (reverse of para. 4-24)

(5) Remove all deck units (reverse of para. 4-25), leaving a deck unit in the third recess of bay 3 and another at the rear of bay7. Start on far bank end of bridge.

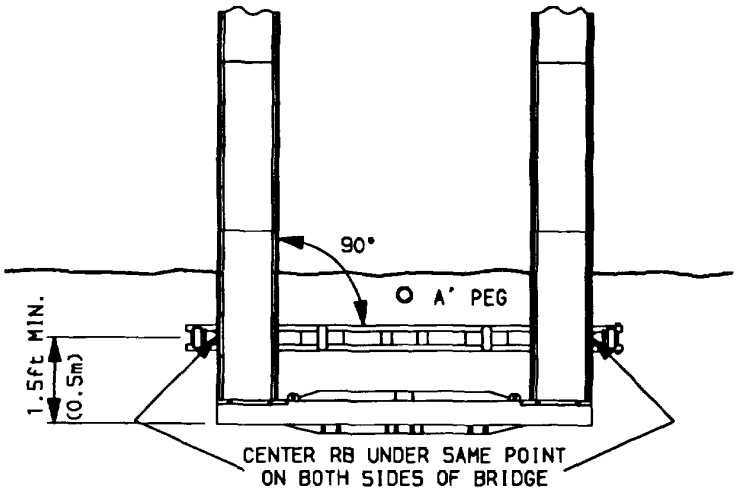
(6) Remove ramp units on near bank, removing center ramp first.

WARNING

The near bank end of bridge Is always raised and placed on a roller beam before the far bank end of bridge is raised.

(7) Jack up near bank end of bridge high enough to slide assembled roller beam under. Place packing under girders as close to edge of gap as possible while bridge is being raised.

(8) Lower bridge onto packing, remove jacks, and slide roller beam under end of bridge at least 1.5 ft (0.5 m) from end of bridge. If minimum bearing has been used, position roller beam under center hole of bankseat beam.



(a) Ensure that roller beam rollers are locked.

(b) Ensure that roller beam is centered under bridge.
(c) Ensure that roller beam is positioned at a right angle (90°) to bridge.

(9) Lower bridge onto roller beam, removing packing one layer at a time until bridge is on roller beam.

(10) Fit launching nose cross girder posts to headless pins at junction of bays 2 and 3 (para. 4-11a.).

(11) Fit launching nose cross girder to posts at correct height (para. 4-11c.).

(12) Fit launching nose roller to far bankseat beam (para. 4-10)

(13) Move vehicle into position about 15 ft (4.6 m) from end of bridge.

(a) Ensure vehicle is straight with bridge.
(b) Center vehicle over centerline.

(14) Connect vehicle to bankseat beam with short push bar (para. 4-18c.).

(15) Assemble launching nose (para. 4-14a.).

(16) Using landing roller pedestal, raise bridge off ground until jack is fully extended.

NOTE
Vehicle is holding bridge and roller catches In RB are locked.

(17) Unlock rollers, delaunch bridge to panel point 9p5 adding remaining launching nose heavies and light always maintaining 5 ft safety distance in front of LRP. Lock rollers.

(18) Disconnect vehicle from bridge and move vehicle at least 20 ft (6.1 m) from rear of bridge,

(19) Remove bankseat beam (reverse of para. 4-9a.)

(20) Remove bays 12, 11 and 10.

NOTE
During delaunch, if the end of bridge touches ground, lower landing roller pedestal.

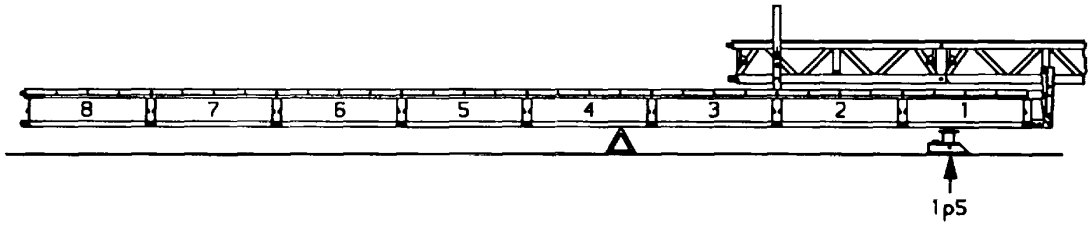
(21) Using vehicle delaunch to panel point 2p7, then raise the bridge to position building pedestals as required to keep rear of bridge off the ground. Note CG of bridge is over roller beam.

(22) Recover landing roller pedestal (para. 4-15c.).

(23) Hold rear of bridge down, unlock rollers and boom bridge to panel point 2pl. Lock rollers.

(24) Disconnect vehicle and remove bay 9.

(25) By hand boom bridge to panel point lp5; lock rollers.



(26) Remove deck unit from bay 7 and 3, then remove bay 8.

(27) Unlock rollers and boom bridge to panel point 1p4. Lock rollers.

(28) To remove sixth nose section (6N1).

(a) Remove retainer clip from panel pin in nose roller and anchorage tube.

(b) With center crew prepared to move launching nose to rear of site, remove panel pin from nose roller.

(c) Lift gravity catch and move launching nose to rear until next anchorage tube is next to nose roller.

1 If nose is uphill, move nose forward until center vertical is in front of nose roller. Put panel pin through nose roller and behind center vertical.

2 If nose is downhill, move nose to rear until center vertical is behind nose roller. Put panel pin through nose roller and in front of center vertical.

(d) Remove nose section (6N1).

(29) Remove bay 7.

(30) Unlock rollers and boom bridge to panel point 1p2. Lock rollers.

(31) Remove three heavy nose sections (5N1, 4N1, 3N1) as described in step (28).

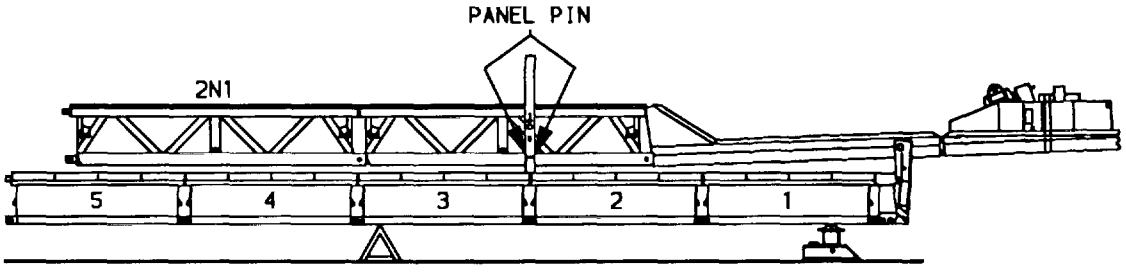
(32) Remove bay 6.

(33) To remove second nose section (2N1).

(a) With center crew prepared to move launching nose to the rear of site, remove panel pin from nose roller.

(b) Lift gravity catch and move launching nose to rear until junction of LLN front and LLN rear is just gap side of nose roller.

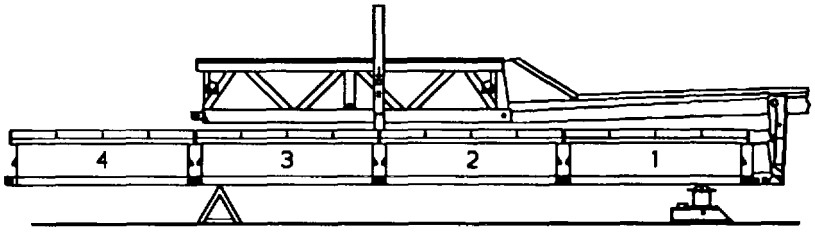
(c) Put a panel pin through the nose section against launching nose cross girder rollers. If tip of nose is uphill place pin in front of rollers, if tip is downhill, place pin behind rollers.



(d) Remove 2N1.

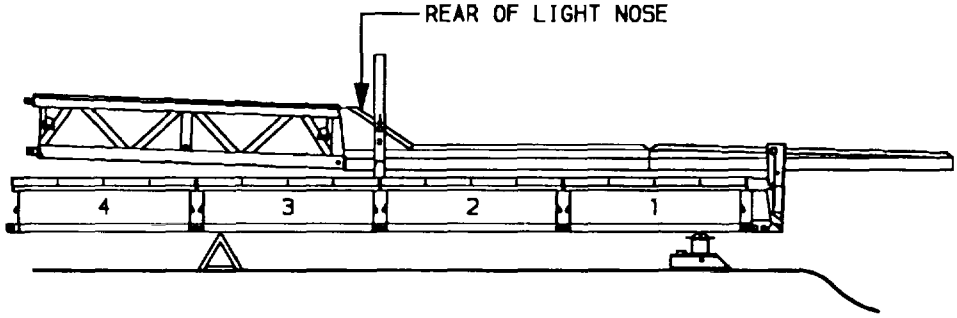
(34) Remove bay 5.

(35) Remove landing roller pedestal from launching nose.



(36) To remove remaining launching nose.

(a) Move launching nose toward rear of site. Stop movement when the rear of the light launching nose rear section is over the launching nose cross girder. Personnel must support launching nose heavy.



(b) Remove heavy nose section.

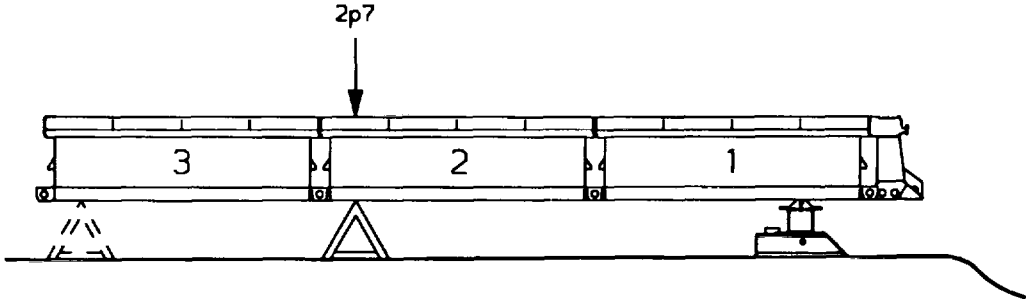
(c) Remove and disassemble light launching nose from nose roller and launching nose cross girder, and place on ground behind launching nose cross girder.

(37) Remove nose roller from bankseat beam (reverse of para.4-10).

(38) Remove launching nose cross girder and posts (para.4-11).

(39) Remove bay 4.

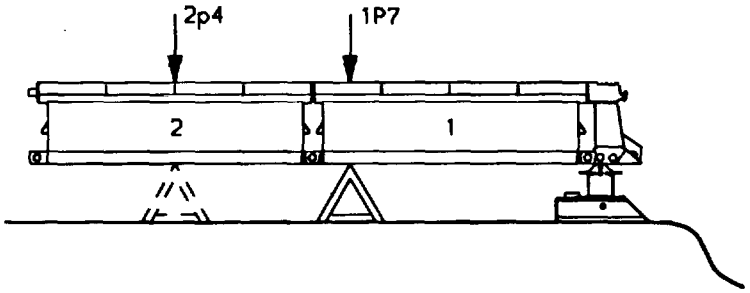
(40) Lift rear of girders at bay 3, and reposition building pedestals under bay 2 at panel point 2p7.



(41) Remove bay 3.

(42) Unlock rollers and boom bridge until bankseat beam is centered over roller beam; lock rollers.

(43) Lift rear of girders at bay 2, and reposition the building pedestals under bay 1 at panel point 1 p7.



(44) Remove bay 2.

(45) Remove bay 1 top panels using at least two personnel to steady bankseat beam on top of roller beam.

(46) Remove bankseat beam from roller beam.

(47) Disassemble roller beam.

(48) Remove all components from site.

Section III. RESTRICTED SITES

A is considered restricted when the construction space (R distance) is less than that given in Table 3-8, Chapter 3. This section describes assembly and disassembly procedures for a 12 bay single story bridge on a site with the less than the minimum construction space on both banks.

5-5. ASSEMBLY - SINGLE STORY - 12 BAY (Restricted Site)

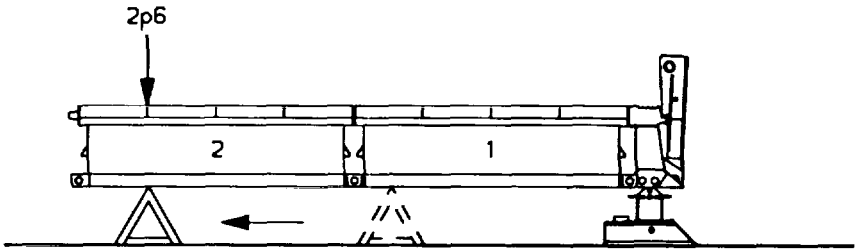
a. General

Construction is made possible by using longer than normal launching nose, and counterweights. Since the procedures are similar to those for a 12 bay bridge on a normal site (para. 5-3), only the steps that are different are given in detail.

b. Assembly

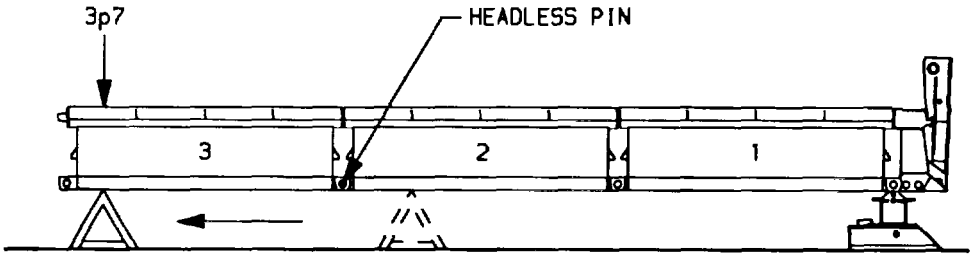
(1) Carry out step a.(1) and (2), and step b.(1) thru (6) as detailed in paragraph 5-3.

(2) Lift girders and move pedestals under rear of bay 2 to panel point 2p6.



(3) Connect top panels of bay 3 to the top panels of bay 2, using a headless pin. This pin is required for connection of launching nose cross girder post.

(4) Lift girders and move pedestals under the rear of bay 3 to panel point 3p7. The building pedestals are now in their final position and no further movement is required.

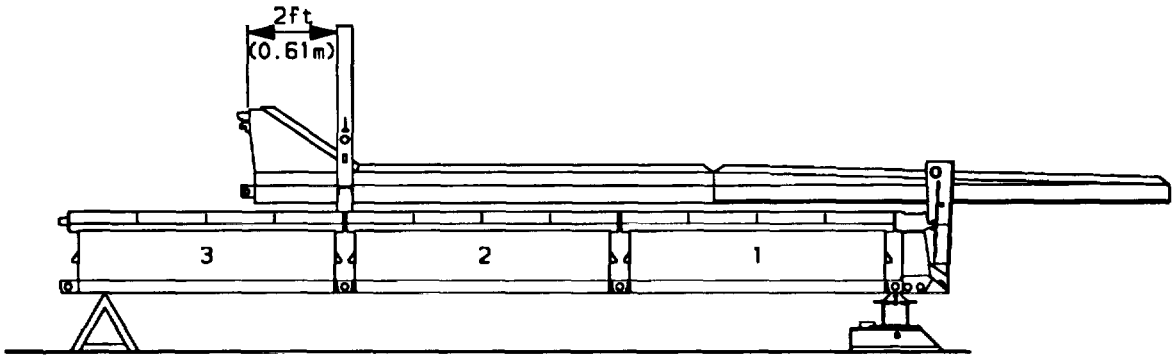


(5) Fit launching nose cross girder post to headless pin at junction of bays 2 and 3.

(6) Fit launching nose cross girder to posts at position 2.

(7) Connect front and rear sections of light nose together.

(8) Place front end of light nose section on nose roller and rear end on nose cross girder. Rear of nose section should extend about 2 ft (0.61 m) behind cross girder.



(9) Add bay 4.

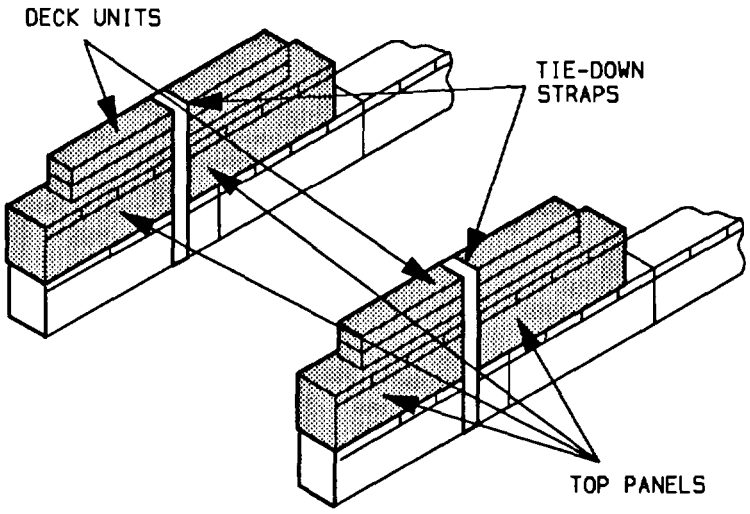
(10) Add first heavy launching nose and landing roller pedestal assembly.

(11) Add 2N1 and 3N1, booming nose and securing with panel pin as each is added.

WARNING

DO NOT try to construct any more nose without counterweight top panels and deck units, otherwise injury to personnel and damage to equipment will occur.

(12) To add counterweight.



(a) Position four top panels and four deck units on rear of bridge, as shown above.

(b) Ensure that counterweights are as far to rear of bridge as possible.

(c) Stack counterweights as shown to provide space for addition of remaining nose sections.

(d) Secure counterweights to bridge girders with two cargo tie-down straps.

(13) Add fourth (4N1) and fifth (5N1) nose sections, booming nose forward and securing with panel pin as each is added.

NOTE

The rear bankseat beam is connected to top panels in the following step, and is part of the counterweight used in the assembly of the longer launching nose.

(14) Unlock roller beam under one girder to ease next operation.

(15) Connect bankseat beam to top panels of bay 4, with shootbolts only.

(16) Add sixth (6N1) and seventh (7N1) nose sections.

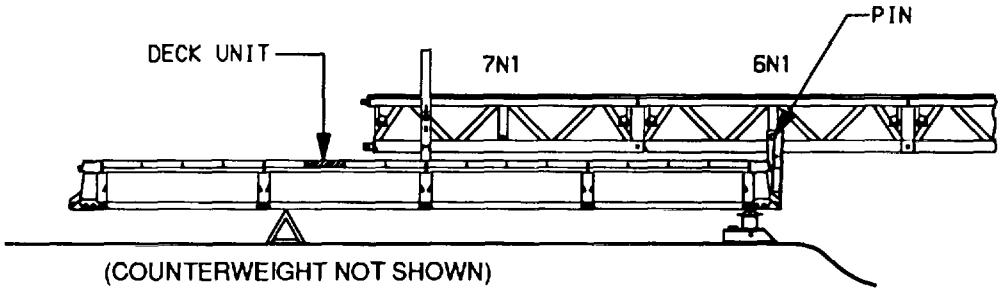
WARNING

In following step bridge will tip as nose is boomed forward. Crew must hold rear of bridge down until step (20).

(17) Boom nose forward until anchorage tube of nose section 6N1 aligns with holes in nose roller.

(18) Put panel pin through nose roller and anchorage tube, then insert retainer clip through panel pin.

(19) Place one deck unit in third deck recess of bay 3.



(20) Set up landing roller pedestal (para. 4-15a.).

(21) To remove counterweight.

(a) Remove counterweight deck and top panels to allow launching nose to set down onto landing roller pedestal.

(b) Far bank crew guide nose onto landing roller pedestal.

(c) DO NOT remove bankseat beam.

(22) Remove building pedestals.

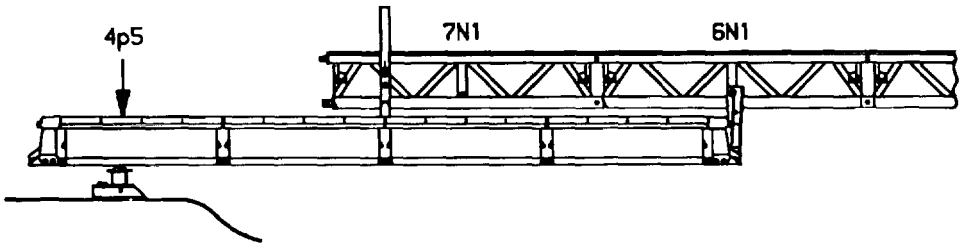
(23) Unlock rollers and boom to panel point 2p7. Lock rollers.

(24) Remove bankseat beam temporarily, and place on ground to one side of site.

(25) Unlock rollers and boom to panel point 4p5.

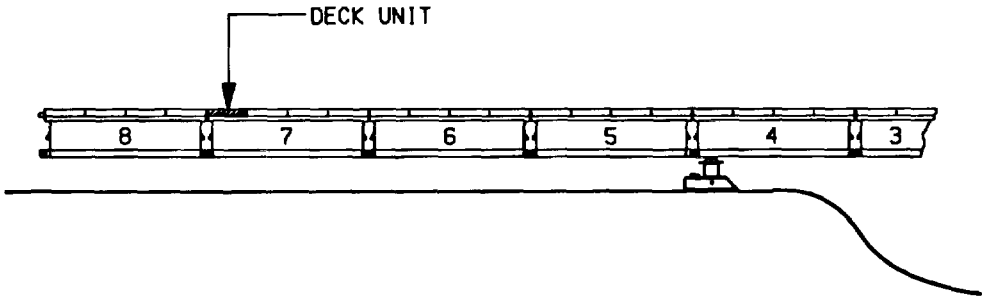
NOTE

Nose sections (light and heavy) can be removed during launch after they have passed the center of the landing roller pedestal. It is important to remember that at least 5 ft (1.5 m) of nose section must extend beyond the landing roller pedestal at all times.



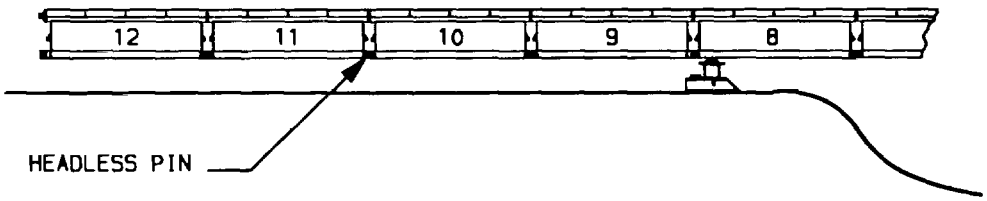
(26) Add bays 5, 6, 7 and 8.

(27) Place one deck unit in last deck unit recess of bay 7.



(28) Unlock rollers and boom bridge to panel point 8p5; lock rollers.

(29) Add bays 9,10,11 and 12. Use a headless pin to connect bay 11 to bay 10.



(30) Refit bankseat beam to end of bridge.

(31) Carry out steps b. (38) thru (52) as detailed in paragraph 5-3 to complete bridge assembly

5-6 DISASSEMBLY - SINGLE STORY - 12 BAY (Restricted Site)

a. General

Disassembly is made possible, by using longer than normal launching nose and counterweight. Since the procedures are similar to a 12 bay bridge on a normal site (para. 5-4) only the that are different are given in detail.

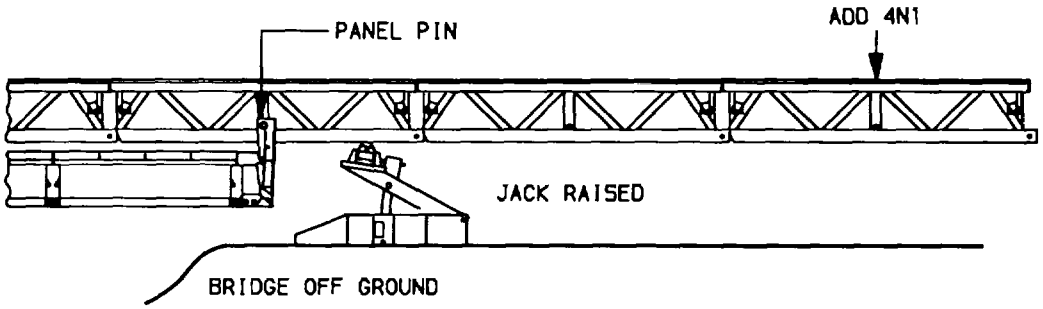
b. Disassembly

(1) Carry out step a. (1) and (2) and step b. (1) thru (15) in paragraph 5-4.

(2) Use landing roller pedestal to raise bridge from ground until jack is fully extended.

NOTE
Vehicle is holding bridge and roller catches in roller beam are locked.

(3) Connect fourth heavy nose section (4N1) to third section (3N1). DO NOT REMOVE panel pin in anchorage tube of second section.



NOTE
During delaunch, if the end of bridge touches ground, lower landing roller pedestal. Add launching noses as required ensuring that at least 5 ft (1.5m) of nose section must extend beyond the landing roller pedestal at all times.

(4) Boom bridge to panel point 8p5.

(5) Remove bankseat beam.

NOTE
After the bankseat beam is removed, place it to one side of the site near the rear of the bridge. It will be put back on later and used as a counterweight to permit retrieval and disassembly of the launching nose.

(6) Remove bay 12.

(7) Remove deck unit from next to last deck unit recess of bay 11.

(8) Remove bays 11, 10 and 9.

(9) Boom bridge to panel point 4p5.

(10) Remove bay 8.

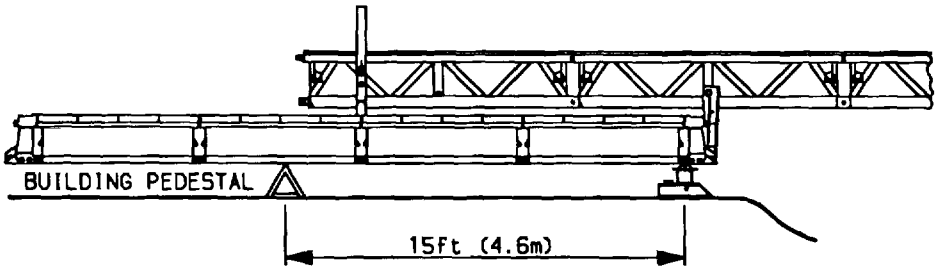
(11) Remove deck unit from next to last deck unit recess of bay 7.

(12) Remove bays 7, 6 and 5.

(13) Refit bankseat beam to end of bay 4 top panels. DO NOT put a panel pin through bankseat beam and top panels.

(14) Boom bridge to panel point 1po.

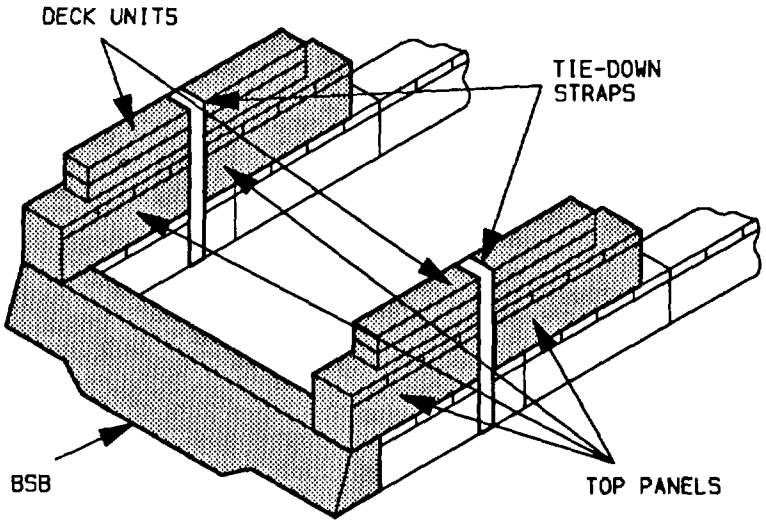
(15) Position building pedestals under girders about 15 ft (4.6 m) behind roller beam.



WARNING

Do not attempt to disassemble the nose without counterweight top panels and deck units, otherwise injury to personnel and damage to equipment will occur.

(16) To add counterweight.



NOTE

As counterweights are added, the rear of the bridge will begin to lower onto the building pedestals.

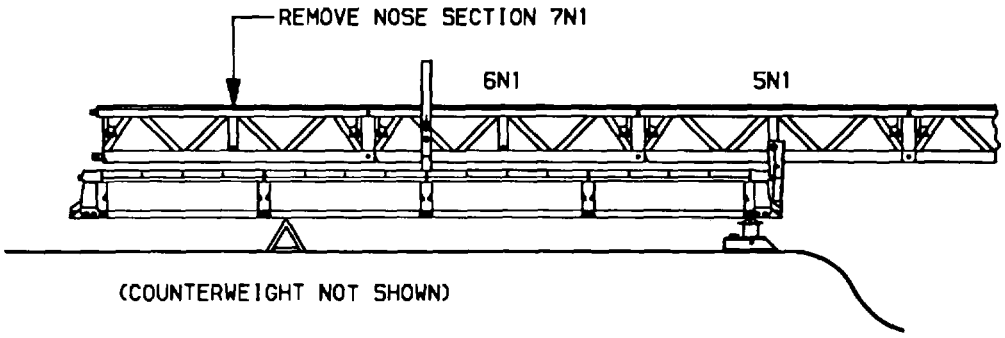
(a) Position four top panels and four deck units on rear of bridge.

(b) Stack counterweights as shown to provide space for removal of nose sections.

(c) Secure counterweights to bridge girders with two cargo tie-down straps.

(17) Recover landing roller pedestal.

(18) Remove seventh nose section (7N1) [para. 5-4b. step (28) (a) thru (c)].



(19) Remove nose section 6N1, as in step (18).

(20) Remove bankseat beam and nose sections 5N1 and 4N1.

(21) Remove counterweight deck units and top panels.

(22) Remove nose section 3N1.

(23) Remove nose section 2N1 [para. 5-4b. step (33)].

(24) Remove landing roller pedestal from launching nose.

(25) Remove nose section 1N1.

(26) Remove bankseat beam.

(27) Carry out steps b. (36) thru (48) as detailed in paragraph 5-4 to complete disassembly.

Section IV. COUNTERWEIGHTS - SINGLE STORY

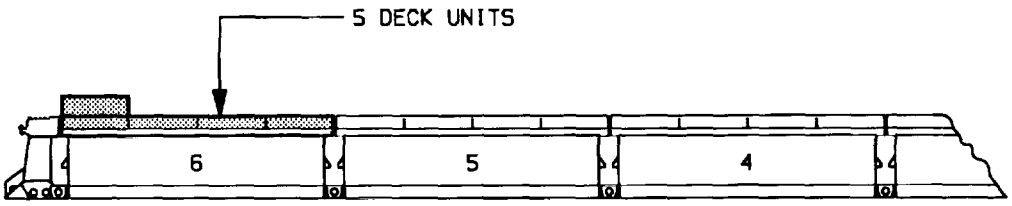
It is necessary to use counterweights during the assembly/disassembly of 6, 7 and 8 bay single story bridges on normal sites and 9, 10, 11 and 12 bay single story bridges on restricted sites. The following paragraphs describe these counterweights but does not describe when they are added or removed. This depends on the size of bridge and type of site.

NOTE

It is important to always refer to the build and boom or delaunch table for the bridge being built or delaunched, to determine when the counterweights are added or removed.

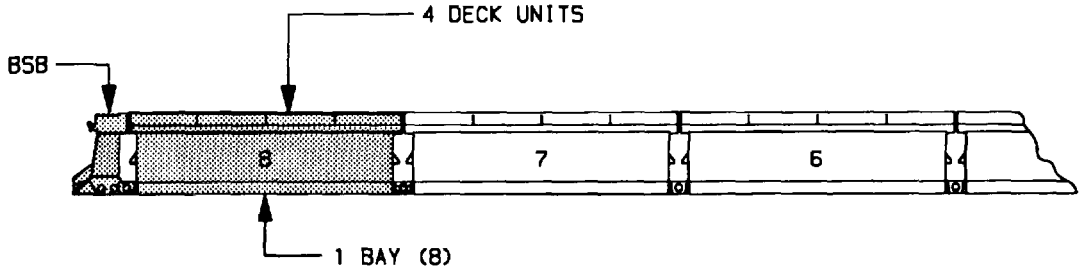
5-7. 6 Bay - NORMAL SITE

On 6 bay single story bridges, five deck units are placed on bay 6 as a counterweight



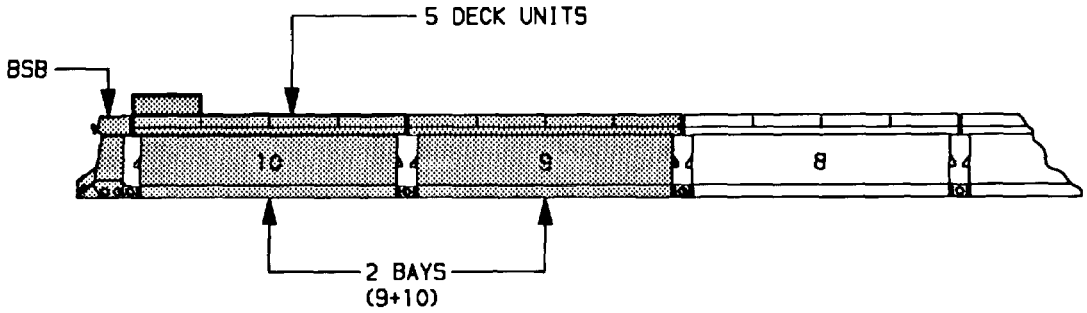
5-8. 7 BAY - NORMAL SITE

On 7 bay single story bridges, two additional bay (bay 8), four deck units and a bankseat beam are used as counterweight. These are later removed and the bankseat beam refitted in the normal end of bridge position



5-9. 8 BAY - NORMAL SITE

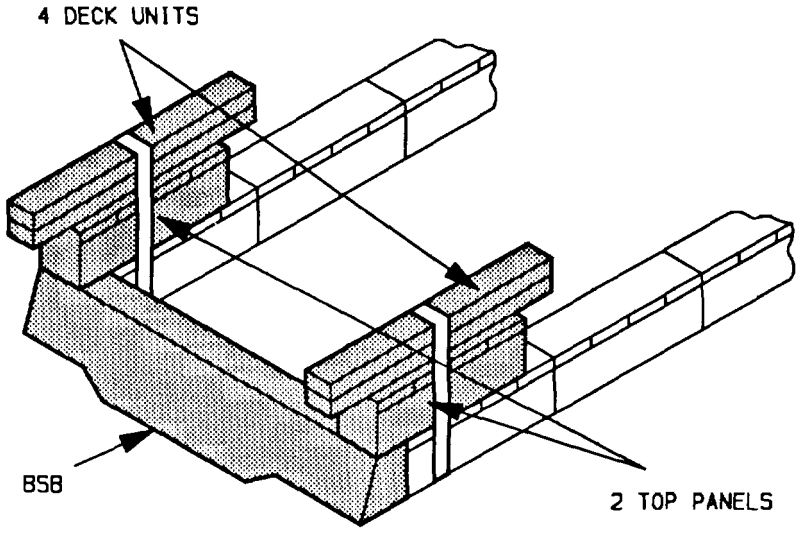
On 8 bay single story bridges, two additional bays (9 and 10), five deck units and a bankseat beam are used as counterweight. These are later removed and the bankseat beam refitted in the normal end of bridge position



5-10 9 AND 10 BAY - RESTRICTED SITE

On 9 and 10 bay single story bridges on a restricted site, two top panels, four deck units and a bankseat beam are used as counterweight. One top panel and two deck units are placed on bay 4 and the bankseat beam on each girder of the bridge. The top panels and deck units are secured with cargo tie down straps.

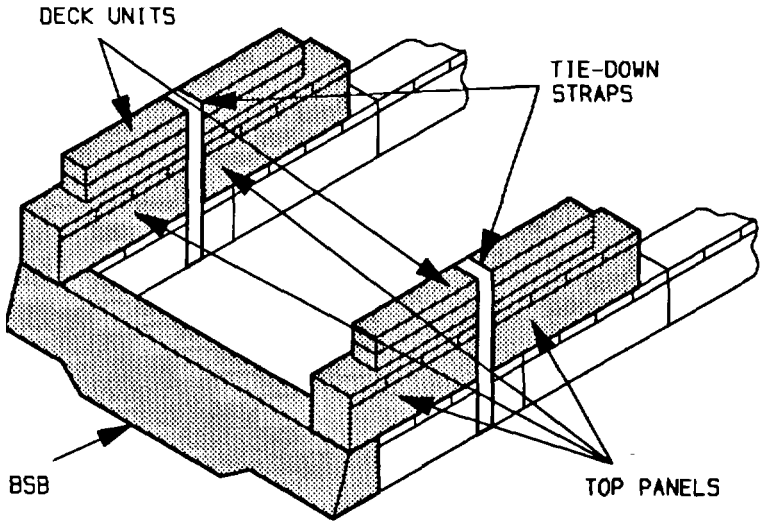
The counterweight is later removed and the bankseat beam refitted in the normal end of bridge position.



5-11 11 AND 12 BAY - RESTRICTED SITE

On 11 and 12 bay single story bridges on a restricted site, four top panels, four deck units and a bankseat beam are used as counterweight. Two top panels and two deck units are placed on bays 3, 4 and the bankseat beam, on each girder of the bridge. The top panels and deck units are secured with cargo tie down straps.

The counterweight is later removed and the bankseat beam refitted in the normal end of bridge position.



Section V. OVERBRIDGES - SINGLE STORY

5-12. GENERAL

This section provides the information needed to construct over bridges in single story configuration. Over bridges are constructed over existing bridges that have been damaged or have a low class capacity.

The abutments of the existing bridge are used as bearing points for the over bridge. It is important to ensure that the over bridge does not come into contact with the existing bridge span while traffic is crossing. Over bridges can be built with or without launching noses.

5-13. DESIGN

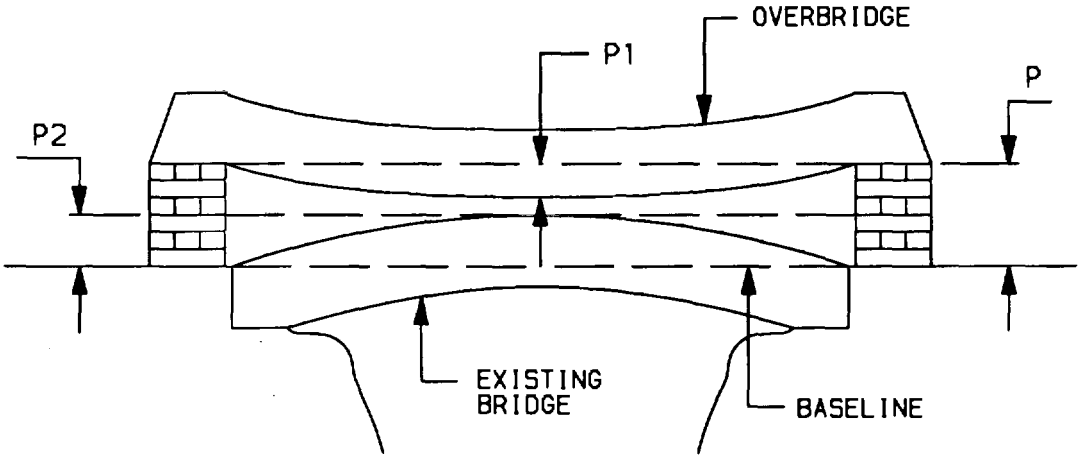
a. The design for over bridges constructed with launching noses is the same as a bridge being built over a gap. Particular attention must be paid to deflection of the far bank end of bridge and launching nose cross girder setting.

b. For all over bridges, the amount of packing under the bankseat beam must be calculated using the following formula, and steps (1) and (2) below:-

P = P1 + P2

where:

P = Height of packing
P1 = Deflection of over bridge
P2 = Height of existing bridge above baseline through bearing points at ends of existing bridge.



(1) Measure height of existing bridge (P2) by using as datum, the baseline joining the ground levels at the proposed locations of the BBS.

(2) Find maximum deflection (P1) of over bridge to be constructed from the following table 5-7.

(3) Using information found in b.(1) and (2), determine amount of packing (P) to be used under the ends of the over bridge.

TABLE 5-7. Central and eccentric deflections - Single Story Bridges

SPAN feet (meters)	DEFLECTION Inches (mm)		
	DEAD LOAD	DEAD LOAD + LIVE LOAD (CENTRAL)	DEAD LOAD + LIVE LOAD (ECCENTRIC)
26 (7.9)	1 (25)	2 (51)	1.75 (44)
32 (9.8)	1 (25)	3.25 (83)	3.25 (83)
38 (11.6)	1.5 (38)	4.75 (121)	5.5 (140)
44 (13.4)	2 (51)	5 25 (133)	6 (152)
50 (15.2)	2.75 (70)	7.5 (190)	8.75 (222)
56 (17.1)	3.5 (89)	8.25 (210)	9.5 (241)
62 (18.9)	4.25 (108)	10.5 (267)	12.25 (310)
68 (20.7)	5.75 (146)	12.75 (324)	15 (381)
74 (22.6)	7.25 (184)	16 (406)	19.5 (495)

Tracked vehicle of maximum load class allowed.

5-14 ASSEMBLY

a. Assembly using a launching nose

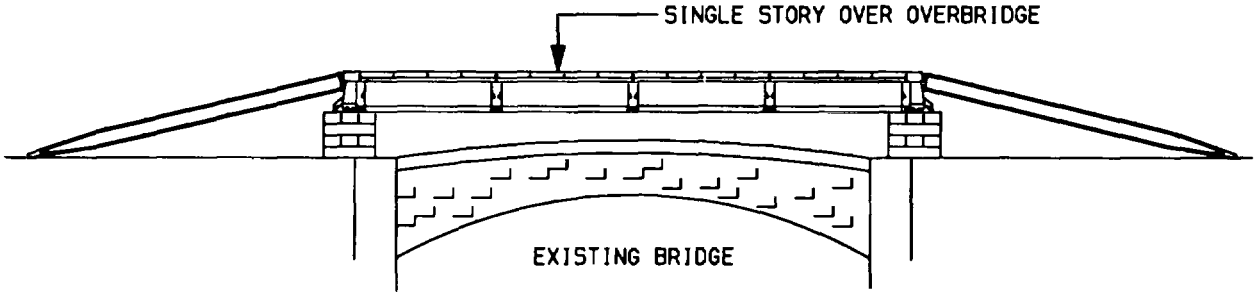
With launching noses, an over bridge is built as if it was being put across a gap. The roller beam closest to the existing bridge must be positioned so that it does not touch the existing span. Also, the roller beam height should be kept high enough to prevent launching nose or far bank end of bridge from coming into contact with the existing span.

(1) Set up rear roller beam/forward roller beam clear of the span to be bridged.

(2) Assemble and launch bridge as though bridging a gap.

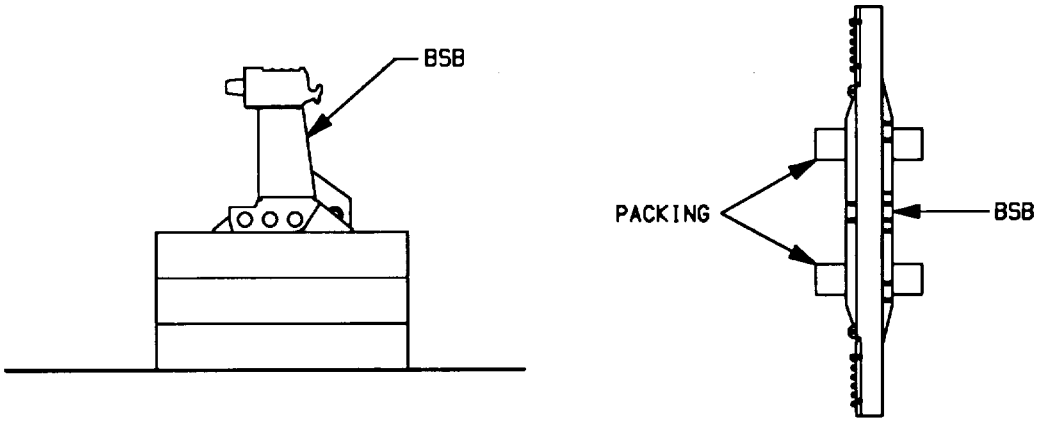
b. Assembly without a launching nose

Without launching noses, an over bridge is built in place over the existing span. Ensure that the existing span is capable of supporting the weight of the over bridge during construction. The following procedure is for the assembly of a 12 bay bridge; shorter bridges use the same method.

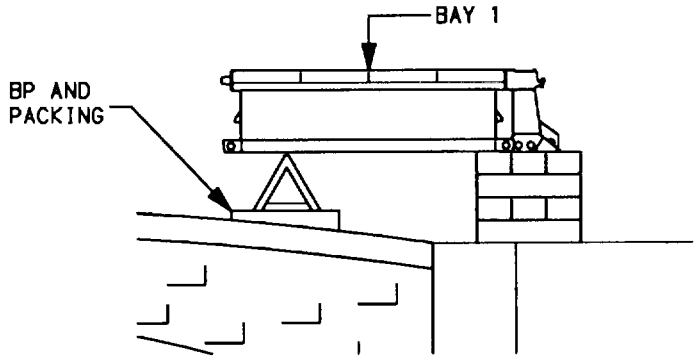


(1) Position and stack packing (3 in x 8 in x 36 in) on site where far end of bridge will set. Packing must be stacked a minimum of 6 in (15.2 cm) and can be stacked as high as required by design.

(2) Place far bank bankseat beam on packing

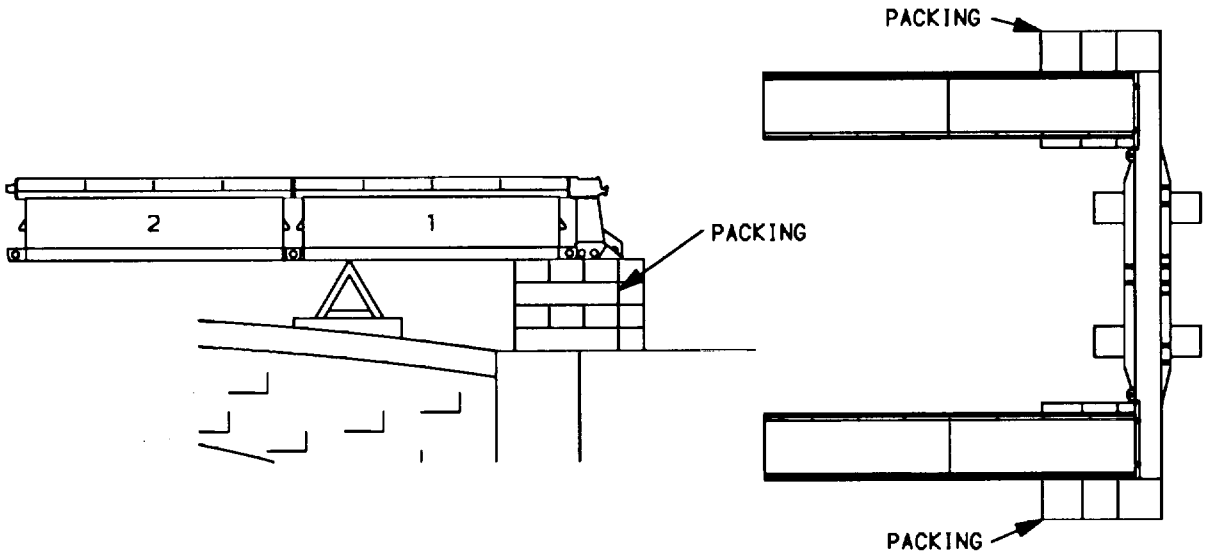


(3) Fit first pair of top panels and position single baseplates and packing under the end of bay 1. Packing on baseplate must be stacked high enough to keep rear of bridge from touching existing span.

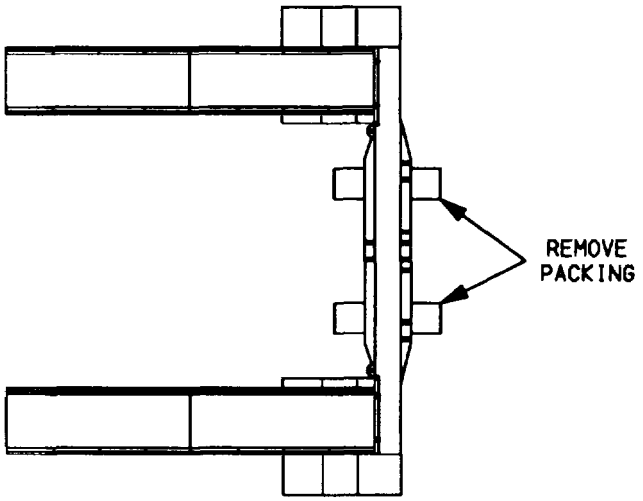


(4) Add bay 2

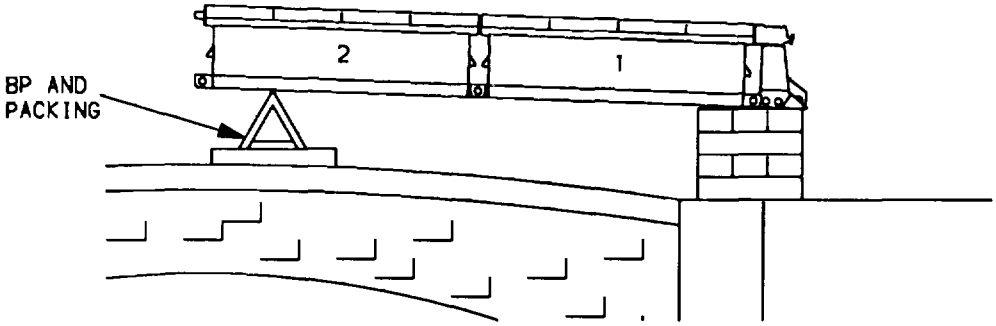
(5) Position and stack packing (3 in x 8 in x 36 in) under bankseat beam and bay 1. Packing must be stacked high enough to keep bridge clear of existing bridge.



(6) Push down on end of bay 2 and remove packing from under bankseat beam.



(7) Lift end of bay 2 and reposition baseplates and packing under rear of bay 2.

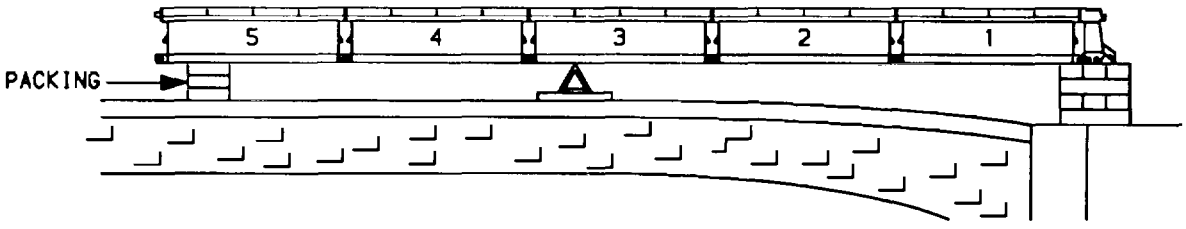


(8) Add bay 3.

(9) Lift end of bay 3 and reposition baseplates and packing under rear of bay 3.

(10) Add bay 4 and bay 5.

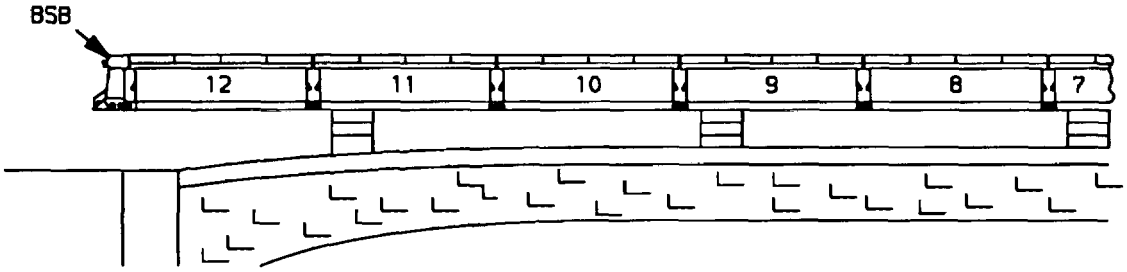
(11) Lift end of bay 5 as high as possible and place packing under end of bay 5. This must be done to ensure that as bays are added, they will not contact existing bridge before all bays are connected.



(12) Continue the same procedure, packing up and fitting top panels to complete 12 bays.

(13) Fit rear bankseat beam.

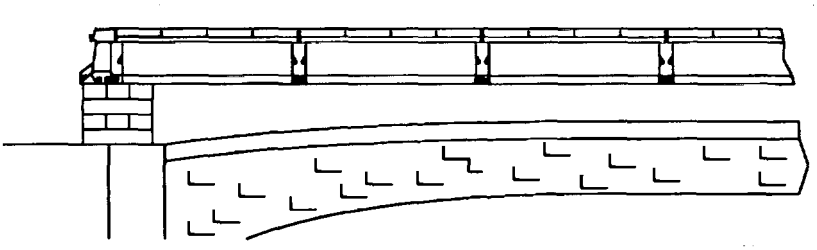
NOTE
Fitting of bankseat beam may require removal of packing from under bay 11.



(14) Jack up rear end of bridge and remove packing and baseplates from under girders.

(15) Position and stack packing (3 in x 8 in x 36 in) under rear bankseat beam and last bay of bridge. Packing must be stacked high enough to ensure that over bridge will not touch existing bridge.

(16) Jack down rear of bridge and remove all jacking equipment.



(17) Anchor bridge if required (see Section VI)

(18) Fit ramps, lay decking, place curbs, and install guide markers.

(19) Post classification signs and clear site of all equipment.

Section VI. ANCHORAGE - SINGLE STORY

This section provides the information used to determine if anchorage is needed, types of anchorages, and procedures for installation. The components used are listed in Appendixes D and E of this TM.

5-15. BASIC CONSIDERATIONS

a. The requirement for anchorage will be determined during site reconnaissance. Factors such as, slope of finished bridge, volume and type of traffic, and bank conditions will be used to determine if anchorage is required.

b. Slope of Finished Bridge. The steeper the slope of the finished bridge, the greater the possibility that anchorage is needed. Consider crossfall of bridge along with slope from end to end. Do not consider the above to mean that completely level bridges will not need anchorages, as the volume and type of traffic and bank conditions must also be considered. Bridges constructed on solid banks or on packing may creep under a high volume of traffic (especially armored, tracked vehicles). If anchorage is not installed, a bridge should be checked during crossing of traffic for any sign of creeping. If creeping is detected anchorage should be installed.

c. Volume and Type of Traffic. Heavy wheeled and tracked vehicles may cause the bridge to creep. This is the result of impact loads against the end of bridge, and braking/accelerating on the bridge. Control of vehicle approach speed and movement across the bridge will reduce these loads. High volume of medium to heavy vehicles in one direction may cause creeping. Stop vehicles prior to impact on the end of bridge and instruct drivers to maintain a constant safe speed, not to shift gears, and not to make any sudden stops.

d. Bank Conditions. Banks that will allow slow settling of the end of the bridge will probably reduce the amount of creeping. Firm, solid banks will increase the need for anchorage.

e. Final Determination. After considering the basic factors, the final determination if anchorage is needed will be made by the bridge commander. If anchorage is not installed, the bridge will be checked regularly for any sign of creeping. If detected, the severity of creeping will be determined, and anchorage will be installed if deemed necessary.

5-16. TYPES OF ANCHORAGE

The types of anchorage used for MGB are Picket and Approach Guy.

a. Picket type. Consists of pickets driven into the bank along the outside of the bankseat beams. Picket type anchorage is installed after the bridge has been put on the ground at both ends, and before ramps are added. During crossing of traffic, check bridge for any sign of creeping.

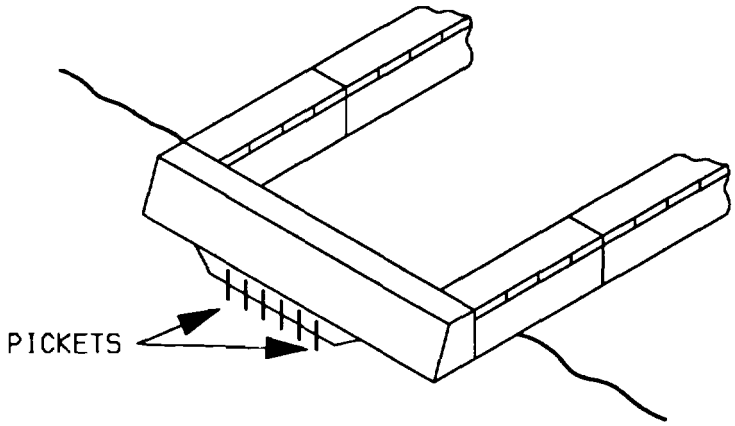
b. Approach Guy Type. Consists of anchorage cables attached to holdfasts at the near bank end and to anchorage pins in the bridge at the other end. Two or four cables can be used at each end of the bridge. Use of this anchorage must be determined prior to construction as the anchorage pins can only be inserted during construction.

NOTE
Anchorage Installation should not Increase building time by more than one half of an hour.

5-17. PICKET TYPE INSTALLATION

Before ramps are added, Install pickets as follows:-

(1) Use hammer to drive pickets into bank at 1 ft (0.3 m) intervals along the outside end of near bankseat beam.

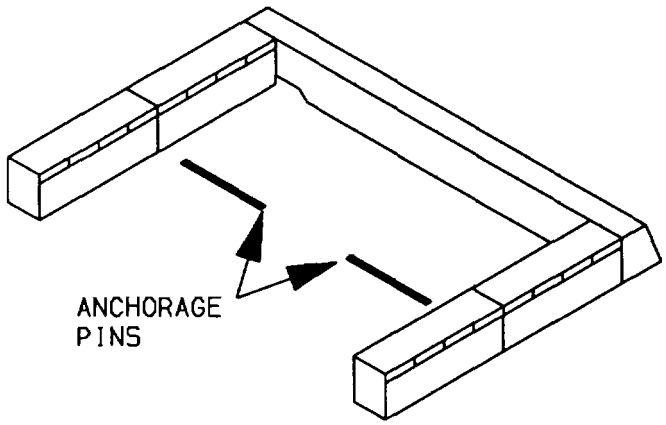


5-18. APPROACH GUY INSTALLATION

During construction, anchorage pins will be used in place of panel pins, as described in the following steps. These procedures are written for the use of two or four cables at each end of bridge. Step (7) can be performed immediately after arrival on site, depending on the availability of personnel.

Installation

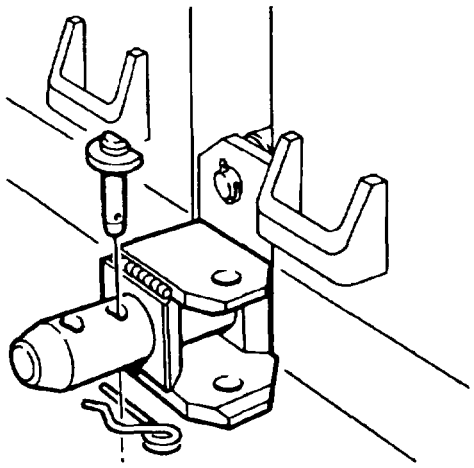
(1) Insert far bank anchorage pins, instead of panel pins, in junction of first and second bay. Anchorage pin must be inserted from inside of bridge.



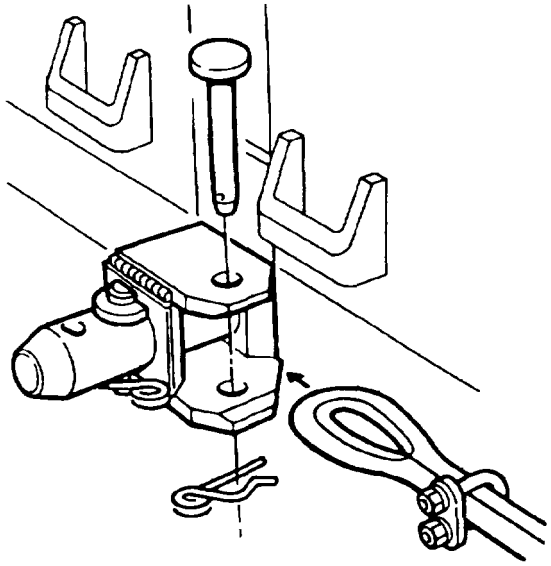
NOTE

Bridge must be boomed until anchorage pin Is In front of roller beam before anchorage lug can be attached.

(2) Attach anchorage lug to end of pin, and secure with retaining pin and retainer clip.



(3) Attach loop(s) of approach guy cable(s) to lug(s) with bracing pin and secure with retainer clip.



(4) Coil cable(s) on top of panels, and secure to carrying bar bracket with light rope.

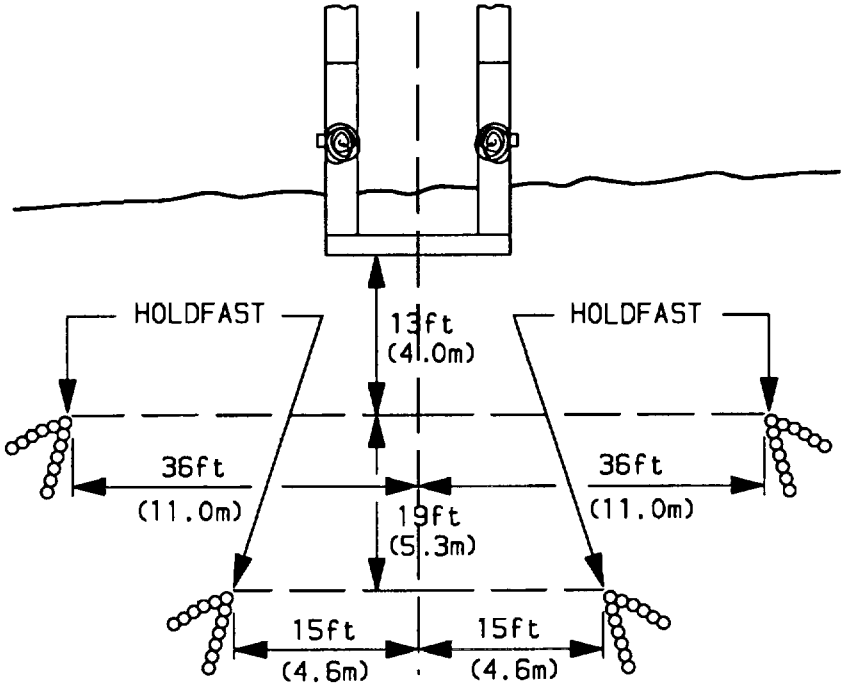
(5) Insert near bank anchorage pins, instead of panel pins, in junction of next to last, and last bay of bridge. Anchorage pin must be inserted from inside of bridge.

(6) Coil cable(s) on top panel [as in step (4)].

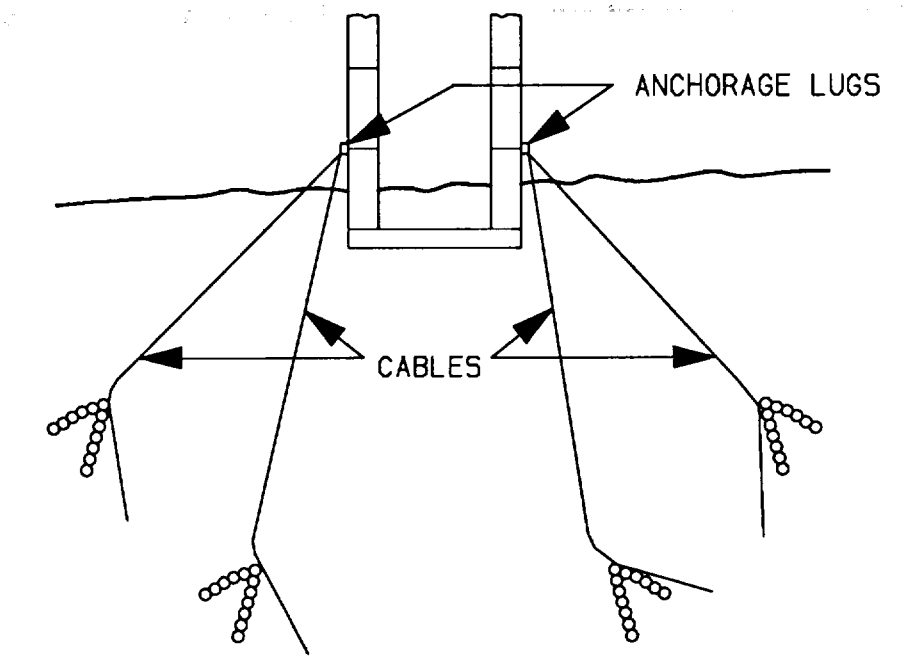
NOTE

The following step can be performed immediately after arrival on site, depending on the availability of personnel. When only two cables are used, use position of inside holdfasts.

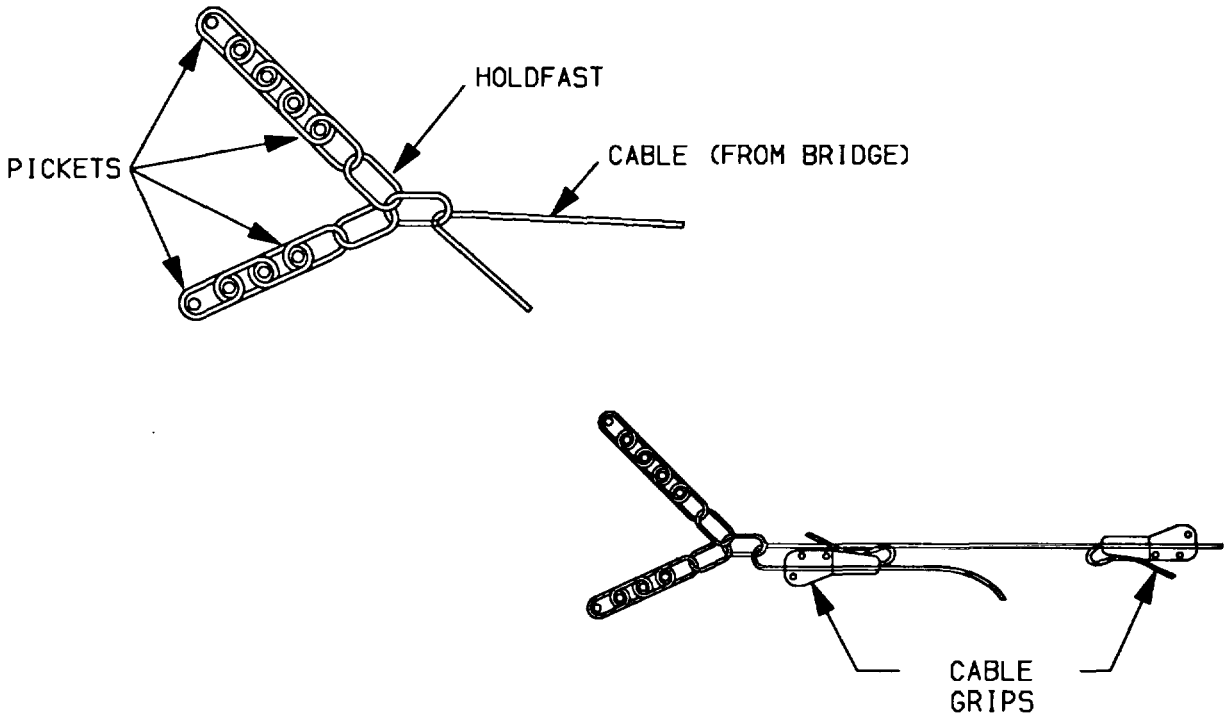
(7) Position chain holdfasts on site as shown. Drive nine pickets through links of each holdfast.



(8) After bridge is lowered to ground, remove and unroll coil(S) of cable from top panels, and stretch out toward holdfasts



(9) Feed running end of cable through link of chain holdfasts, and take up slack by hand and attach cable rips to cable

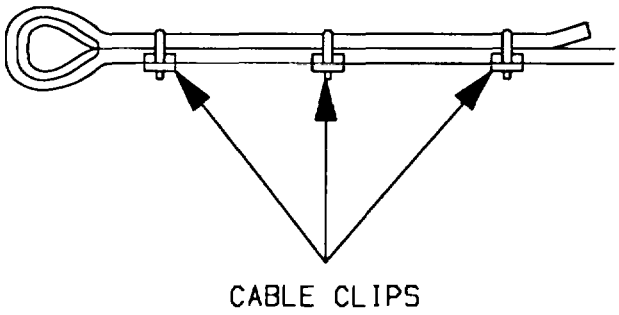


(10) Attach ratchet chain hoists to cable grips and operate chain hoists in unison to tension cables.

(11) Secure cable with minimum of three cable clips.

NOTE

Cable clips are always fitted as shown in sketch below, i.e. with the clamp and nut on the working portion of the cable.



(12) Remove ratchet chain hoist and cable grips.

CHAPTER 6

DOUBLE STORY BRIDGE

		Page
Section I.	GENERAL	6-2
Section II.	NORMAL SITES	6-29
6-1	ASSEMBLY - DOUBLE STORY - 2E + 12 BAY	6-29
6-2	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY	6-34
6-3	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Normal Site - Original Far Bank)	6-40
6-4	ASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT	6-45
6-5	DISASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT	6-50
Section III.	RESTRICTED SITES	6-55
6-6	ASSEMBLY - DOUBLE STORY 2E + 12 BAY (Restricted Site)	6-56
6-7	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Near Bank)	6-58
6-8	DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Original Far Bank)	6-60
Section IV.	COUNTERWEIGHTS - DOUBLE STORY	6-64
6-9	2E + 19 thru 2E + 22 w/o LRS - NORMAL SITE	6-64
6-10	2E + 13 thru 2E + 18 w/o LRS - RESTRICTED SITE	6-64
6-11	2E + 19 thru 2E + 22 w/o LRS - RESTRICTED SITE	6-65
Section V.	OVERBRIDGES - DOUBLE STORY	6-67
6-12	GENERAL	6-67
6-13	DESIGN	6-67
6-14	ASSEMBLY	6-68
Section VI.	ANCHORAGE - DOUBLE STORY	6-72
6-15	BASIC CONSIDERATIONS	6-72
6-16	TYPES OF ANCHORAGE	6-72
6-17	PICKET TYPE INSTALLATION	6-73
6-18	APPROACH GUY INSTALLATION	6-73

Section I. GENERAL

a. Introduction. The construction (assembly) and delaunch (disassembly) of double story bridges are described in step by step procedures in this chapter.

The assembly procedures start with the setting up and alignment of the roller beam, followed by step by step assembly instructions to construct the bridge. Similarly, disassembly procedures contain full step by step instructions. Disassembly is not the exact reverse of assembly; there are differences, therefore the step by step procedures shall be followed carefully. These procedures are covered in more detail in Chapter 4 General Drills. The operator should be familiar with these drills before following the step by step procedures in this chapter.

When familiarity is gained with the general drills and the step by step procedures, any double story bridge can be assembled using the Build and Boom Tables, and disassembled using the Delaunch Tables.

NOTE

Do not attempt to use the Tables until the general drills and step by step procedures have been practiced a number of times.

TABLE 6-1. Building and Boom Table - 2E + 1 through 2E + 6 Bay Double Story (Normal Site)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5	60 18.3	66 20.1
2E + No. of Bays	1	2	3	4	5	6
L/Nose	2N1	3N1	3N1	3N1	4N1	4N1
Build E + 1 with RRB at: Add (CG)	 1p2 Note a 2N1* E (1p0)	 1p2 Note a 2 3N1* (Bp5)	 1p2 Note a 2,3 3N1* (Bp0)	 1p2 Note a 2,3 3N1* 4 (Ap2)	 1p2 Note a 2,3 4N1* 4 (Ap2)	 1p2 Note a 2,3 4N1* 4 (Ap2)
Boom Add (CG)		1p6 E (1p2)	2p4 E (1p6)	3p0 E (2p3)	3p0 5, E (2p5)	3p0 5, 6 (1p6)
Boom Add (CG)						4p0 E (3p1)
Launch Position LRP	(1pO) LZ 3 Note b	(1p2) LZ 8 Note b	(1p6) LZ 5 Note b	(2p3) LZ 4 Note b	(2p5) LZ 8 Note b	(3pl) LZ 5 Note b
Launch Remove	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Complete by	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check the LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs FRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add entire launching nose with LRP secured with tie down strap.
( ) Center of gravity.

TABLE 6-2. Building and Boom Table - 2E + 7 through 2E + 12 Bay Double Story (Normal Site)

Bridge ft Length m	72 21.9	78 23.8	84 25.6	90 27.4	96 29.3	102 31.1
2E + No. of Bays	7	8	9	10	11	12
L/Nose	4N1	5N1	5N1	5N1	6N1	6N1
Build E + 1 with RRB at: Add (CG)	 1p2 Note a 2,3 4N1* 4 (Ap2)	 1p2 Note a 2,3 5N1* 4,5 (1p0)	 1p2 Note a 2,3 5N1* 4,5 (1p0)	 1p2 Note a 2,3 5N1* 4,5 (1p0)	 1p2 Note a 2,3 6N1* 4,5 (Ap2)	 1p2 Note a 2,3 6N1* 4,5 (Ap2)
Boom Add (CG)	3p0 5,6,7 (2p2)	3p2 6,7,8 (2p5)	3p2 6,7,8 (2p5)	3p2 6,7,8 (2p5)	3p0 6,7,8 (2p3)	3p0 6,7,8 (2p3)
Boom Add (CG)	4p4 E (3p6)	4p6 E (3p7)	4p6 9,E (4p3)	4p6 9,10 (3p5)	4p4 9,10,11 (3p7)	4p4 9,10,11 (3p7)
Boom Add (CG)			5p7 (5p0)	6p1 E (5p2)	6p1 E (5p6)	 12, E
Launch Position LRP	(3p6) LZ 4 Note b	(3p7) LZ 8 Note b	(4p3) LZ 5 Note b	(5p0) LZ 3 Note b	(5p2) LZ 8 Note b	(5p6) LZ 5 Note b
Launch Remove	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Complete by	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check the LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs FRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add entire launching nose with LRP secured with tie down strap.
( ) Center of gravity.

TABLE 6-3. Building and Boom Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS) (Normal Site)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E + No of Bays	13	14	15	16	17
L/Nose	6N1	7N1	7N1	7N1	8N1
Build E + 1 with RRB at: Add (CG)	 1p2 Note a 2,3 6N1*4 5 (Ap2)	 1p2 Note a 2,3 7N1*,4 5,6 (1p0)	 1p2 Note a 2,3 7N1*,4 5,6 (1p0)	 1p2 Note a 2,3 7N1*,4 5,6 (1p0)	 1p2 Note a 2,3 7N1*4 5 8N1**,6 (Ap2)
Boom Add (CG)	3p0 6,7,8 (2p3)	3p2 7,8,9 (2p5)	3p2 7,8,9 (2p5)	3p2 7,8,9 (2p5)	3p0 7,8,9 (2p3)
Boom Add (CG)	4p4 9,10,11 (4p0)	4p7 10,11,12 (4p2)	4p7 10,11,12 (4p2)	4p7 10,11,12 (4p2)	4p5 10,11,12 (3p7)
Boom Add (CG)	11p0 12,13 E (6p2)	11p0 13,14 E (6p4)	11p 13,14,15 E (7pl)	11p0 13 thru 16 E (7p5)	10p7 13 thru17 E (8p0)
Launch Position LRP	(6p2) LZ 3 Note b	(6p4) LZ 7 Note b	(7pl) LZ 5 Note b	(7p5) LZ 3 Note b	(8p0) LZ 8 Note b
Launch Remove	10p6 FRB,RRB	11p6 FRB,RRB	12p6 FRB,RRB	13p6 FRB,RRB	14p6 FRB,RRB
Complete by	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check that LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs CRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add given length launching nose with LRP secured with tie down strap.
** Nose completed by adding 8th LNH or 6 LNH required for 3N2 (double-story nose).
( ) Center of gravity.

TABLE 6-4. Building and Boom Table - 2E + 18 through 2E + 22 bay Double Story (w/o LRS) (Normal Site)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E + No of Bays	18	19	20	21	22
L/Nose	8N1	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight		[20D + 6C]	[20D + 6C]	[20D + 6C]	[20D + 6C]
Build E + 1 with RRB at: Add (CG)	 1p2 Note a 2,3 7N1*,4 5 8N1**,6 (Ap2)	 1p2 Note a 2,3 6N1*,4 5 3N2**,6 (Bp2)	 1p2 Note a 2,3 6N1'*,4 5 3N2**,6 (Bp2)	 1p2 Note a 2,3 6N1*,4 5 3N2**,6 (Bp2)	 1p2 Note a 2,3 6N1*,4 5 3N2**,6 (Bp2)
Boom Add (CG)	3p0 7 thru 9 (2p3)	2p4 7 thru 9 (2p0)	2p4 7 thru 9 (2p0)	2p4 7 thru 9 (2p0)	2p4 7 thru 9 (2p0)
Boom Add (CG)	4p5 10+11+12 (3p7)	4p2 10 thru 13 (4p0)	4p2 10 thru 13 (4p0)	4p2 10 thru 13 (4p0)	4p2 10 thru 13 (4p0)
Boom Add (CG)	10p7 13 thru 18 E (8p4)	11p0 14 thru 19 E+[20D+6C] (9p0)	11p0 14 thru 20 E+[20D+6C] (9p7)	11p0 14 thru 21 E+[20D+6C] (10p3)	11p0 14 thru 22 E+[20D+6C] (10p7)
Launch Position LRP	(8p4) LZ 5 Note b	(9p0) LZ 2 Note b	(9p7) LZ 4 Note b	(10p3) LZ 5 Note b	(10p7) LZ 6 Note b
Launch to Remove	15p5 FRB,RRB	16p5 FRB,RRB	17p5 FRB,RRB	18p5 FRB,RRB	19p5 FRB,RRB
Complete by	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check that LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs CRB by 1.5 ft (0.5 m).
d. Put bridge on ground.

* Add given length of launching nose with LRP secured with tie down strap.
** Nose completed by adding 8th LNH or 6 LNH required for 3N2 (double-story nose).
[ ] Counterweight.
( ) Center of gravity.

TABLE 6-5. Building and Boom Table - 2E + 1 through 2E + 6 Bay Double Story (Restricted Site)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5		60 18.3		66 20.1	
2E + No. of Bays	1	2	3	4		5		6	
L/Nose	3n1	4N1	4N1	4N1	4N1	5N1	5N1	6N1	5N1
Build E + 1 with RRB at: Add (CG)	1p2 Note a 3N1* (Cp1)	1p2 Note a 2 4N1* (Bp7)	1p2 Note a 2 4N1* (Bp7)	1p2 Note a 2 4N1* (Bp7)	1p2 Note a 2 5N1* (Cp1)	1p2 Note a 2 5n1* (Cp1)	1p2 Note a 2 6n1* (Cp4)	1p2 Note a 2,3 5n1* (Bp4)	1p2 Note a 2 6N1* (Cp4)
Boom Add (CG)				1p7 3 (Bp2)		1p7 3 (Bp4)		2p2 4 (Bp0)	
Boom Add (CG)				2p4 4 (Ap2)		2p2 4 (Bp0)		2p6 5 (1po)	
Launch Position LRP	LZ 3 Note b	(Cp1) LZ 8 Note b	(Bp7) LZ 2 Note b	(Bp7) LZ 3 Note b	(Ap2) LZ 6 Note b	(Cp1) LZ 2 Note b	(Bp0) LZ 6 Note b	(Cp4) LZ 2 Note b	(Cp0) LZ 1 Note b
Launch Remove	Bp1 RRB	1p4 RRB	1p4 RRB	lp4 RRB	2p4 RRB	1p4 RRB	2p4 RRB	1p4 RRB	3p4 RRB
Launch Add	1p4 E	2p4 E	2p4 3	4p4 E	2p4 3	4p4 5	2p4 3	5p4 6	2p4 3
Launch Add			3p4 E		3p4 4	5p4 E	3p4 4	6p4 E	3p4 4
Launch Add					4p4 E		4p4 5		4p4 5
Launch Add							5p4 E		5p4 6
Launch Add									6p4 E
Complete by	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs CRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add entire launching nose with LRP secured with tie down strap.
( ) Center of gravity.

TABLE 6-6. Building and Boom Table - 2E + 7 through 2E + 9 Bay Double Story (Restricted Site)

Bridge ft Length m	72 21.9		78 23.8		84 25.6	
2E + No. of Bays	7	8	9			
L/Nose	5N1	6N1	6N1	7N1	6N1	7N1
Build E+1 with RRB at Add (CG)	1p2 Note a 2,3,5N1* (Bp4)	1p2 Note a 2,3, 6N1*, (Bp7)	1p2 Note a 2,3, 6N1* (Bp7)	1p2 Note a 2,3, 7N1*,4 (Bp5)	1p2 Note a 2,3,6N1* (Bp7)	1p2 Note a 2,3,7N1*,4 (BP5)
Boom Add (CG)	2p2 (1p0)	1p7 4 and 5 (Bp2)	1p7 4 (Bp2)	1p7 4	2p1 (Ap2)	 4 and 5 (Bp0)
Boom Add (CG)	3p2 6 (1p4)		2p4 5 (Ap2)		3p0 6 (1p2)	
Boom Add (CG)	3p7 7 (2p0)		3p0 6 (1p2)		3p4 7 (1p6)	
Boom Add (CG)					4p0 8 (2p3)	
Launch Position LRP	(2p0) LZ 2 Note b	(Bp2) LZ 2 Note b	(1p2) LZ 2 Note b	(Bp5) LZ 4 Note b	(2p3) LZ 3 Note b	(Bp0) LZ 1 Note b
Launch Remove	5p4 RRB	2p4 RRB	4p4 RRB	2p4 RRB	6p4 RRB	3p4 RRB
Launch Add	7p4 E	4p4 5	6p4 7	4p4 5	8p4 9	5p4 6
Launch Add		5p4 6	7p4 8	5p4 6	9p4 E	6P4 7
Launch Add		6p4 7	8p4 E	6p4 7		7p4 8
Launch Add		7p4 E		7p4 8		8p4 9
Launch Add				8p4 E		9p4 E
Complete By:	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs CRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add entire launching nose with LRP secured with tie down strap.
( ) Center of gravity.

TABLE 6-7. Building and Boom Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
Build E+1 with RRB at: Add (CG)	1p2 Note a 2,3 6N1* (Bp7)	1p2 Note a 2,3 7N1* (Bp5)	1p2 Note a 2,3 7N1* (Bp0)	1p2 Note a 2,3 7N1* (Cp0)	1p2 Note a 2,3 7N1* (Bp0)	1p2 Note a 2,3 7N1* (Cp0)
Boom Add (CG)	1p7 4,5 (Ap2)	2p1 5 (Bp0)	2p6 6,7 (1p4)	1p6 5 (Bp3)	2p6 6,7 (1p4)	1p6 5 (Bp3)
Boom Add (CG)	3p0 6,7 (1p6)	2p6 6 (1p0)	3p6 8 (2p1)	2p3 6 (Ap2)	3p6 8,9 (2p5)	2p3 6 (Ap2)
Boom Add (CG)	4p0 8 (2p3)	3p2 7 (1p0)	4p2 9 (2p5)		4p7 10 (3p1)	3p0 7 (1p2)
Boom Add (CG)	4p4 9 (2p7)				5p3 11 (3p5)	3p4 8 (1p6)
Boom Add (CG)	5p1 10 (3p3)					
Launch Position LRP	(3p3) LZ 3 Note b	(1p4) LZ 1 Note b	(2p5) LZ 2 Note b	(Ap2) LZ 1 Note b	(3p5) LZ 2 Note b	(1p6) LZ 1 Note b
Launch Remove	8p4 RRB	5p4 RRB	7p4 RRB	4p4 RRB	9p4 RRB	6p4 RRB
Launch Add	10p4 E	7p4 8	9p4 10	6p4 7	11p4 12	8p4 9
Launch Add		8p4 9	10p4 11	7p4 8	12p4 E	9p4 10
Launch Add		9p4 10	11p4 E	8p4 9		10p4 11
Launch Add		10p4 E		9p4 10		11p4 12
Launch Add				10p4 11		12p4 E

TABLE 6-7. (cont'd) Building and Boom Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
Launch Add				11p4 E		
Complete By:	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d	Note c,d

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Check LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
c. Launch until far bank end of bridge is 9 in (23 cm) from LRP, or end of ETP overhangs CRB by 1.5 ft (0.5 m).
d. Put bridge on ground.
* Add given length of launching nose with LRP secured with tie down strap.
** Nose completed by adding 8th LNH.
( ) Center of gravity

TABLE 6-8. Delaunch Table - 2E + 1 through 2E + 6 Bay Double Story (Normal Site)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5	60 18.3	66 20.1
2E + No. of Bays	1	2	3	4	5	6
L/Nose	2N1	3N1	3N1	3N1	4N1	4N1
V Distance ft m	38 11.6	45 13.7	51 15.5	55.8 17.0	63 19.2	69 21.0
Build	Notes a,b, and c,	Notes a,b, and d	Notes a,b, and d	Notes a,b, and d	Notes a,b, d and e	Notes a,b, d and e
Delaunch Add	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Delaunch Recover	(1p0) LRP	(1p2) LRP	(1p6) LRP	(2p3) LRP	(2p5) LRP	(3p1) LRP
Boom Remove(CG)						4p0 E (1p6)
Boom Remove(CG)			2p4 E (Bp0)	3p0 E (Ap2)	3p0 E and5 (Ap2)	3p0 6 and 5 (Ap2)
Boom Remove (CG) Remove	1p2 E (Bp7) 2N1*	1p6 E (Bp5) 3N1* 2	1p2 3N1* 3,2	1p2 4 (Bp0) 3N1* 3,2	1p2 4 (Bp2) 4N1* 3,2	1p2 4 (Bp2) 4N1* 3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note f	Note f	Note f	Note f	Note f	Note f

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min. 1.5 ft (0.5 m) *from* end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB. Add LNCG posts, LNCG and nose roller.
c. For 2E + 1 only. Add 2 LNH and LLN.
d. For 2E + 2 through 2E + 12,add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
e. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
f. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-9. Delaunch Table - 2E + 7 through 2E + 12 Bay Double Story (Normal Site)

Bridge ft Length m	72 21.9	78 23.8	84 25.6	90 27.4	96 29.3	102 31.1
2E + No. of Bays	7	8	9	10	11	12
L/Nose	4N1	5N1	5NI	5N1	6N1	6N1
V Distance ft m	74 22.6	81 24.7	87 26.5	92 28.0	99 30.2	105 32.0
Build	Notes a,b, d,e	Notes a,b, d,e	Notes a,b, d,e	Notes a,b, d,e	Notes a,b, d,e	Notes a,b, d,e
Delaunch Add	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Delaunch Recover	(3p6) LRP	(3p7) LRP	(4p3) LRP	(5pO) LRP	(5p2) LRP	(5p6) LRP
Boom Remove (CG)				5p7 E (3p5)	6p1 E (3p7)	6p1 E,12 (3p7)
Boom Remove (CG)	4p4 E (2p2)	4p6 E (2p5)	4p6 E,9 (2p5)	4p6 10,9 (2p5)	4p4 11,10 9 (2p3)	4p4 11,10 9 (2p3)
Boom Remove (CG)	3p0 7,6 5 (Ap2)	3p2 8,7 6 (1p0)	3p2 8,7 6 (1p0)	3p2 8,7 6 (1p0)	3p0 8,7 6 (Ap2)	3p0 8,7 6 (Ap2)
Boom Remove (CG) Remove	1p2 4 (Bp2) 4N1* 3,2	1p2 5,4 (Bp5) 5N1* 3,2	1p2 5,4 (Bp5) 5N1* 3,2	1p2 5,4 (Bp5) 5N1* 3,2	1p2 5,4 (Bp7) 6N1* 3,2	1p2 5,4 (Bp7) 6N1* 3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note f	Note f	Note f	Note f	Note f	Note f

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min. 1.5 ft (0.5 m) from end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB. Add LNCG posts, LNCG and nose roller.
c. For 2E + 1 only. Add 2 LNH and LLN.
d. For 2E + 2 through 2E + 12,add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
e. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
f. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-10. Delaunch Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS) (Normal Site)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	130 40.2
2E + No of Bays	13	14	15	16	17
L/Nose	6N1	7N1	7N1	7N1	8N1
Counterweight	-	-	-	-	
V Distance ft m	110 33.5	117 35.7	123 37.5	128 39	134.8 41.1
Build	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c
Delaunch Add	10p6 FRB,RRB	11p6 FRB,RRB	12p6 FRB,RRB	13p6 FRB,RRB	14p6 FRB,RRB
Delaunch Recover	(6p2) LRP	(6p4) LRP	(7p1) LRP	(7p5) LRP	(8p0) LRP
Boom Remove (CG)	11p0 E,13,12 (4p0)	11p0 E,14,13 (4p2)	1p0 E,15 thru 13 (4p2)	11p0 E,16 thru 13 (4p2)	10p7 E,17 thru 13 (3p7)
Boom Remove (CG)	4p4 11,10,9 (2p3)	4p7 12 thru 10 (2p5)	4p7 12 thru 10 (2p5)	4p7 12 thru 10 (2p5)	4p5 12 thru 10 (2p3)
Boom Remove (CG)	3p0 8,7,6 (Ap2)	3p2 9 thru 7 (1p0)	3p2 9 thru 7 (1p0)	3p2 9 thru 7 (1p0)	3p0 9 thru 7 (Ap2)
Boom Remove	1p2 5 6N1*,4 3,2	1p2 6,5 7N1*,4 3,2	1p2 6,5 7N1*,4 3,2	1p2 6,5 7N1*,4 3,2	1p2 6,8N1** 5 7N1*,4 3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Completed by	Note d	Note d	Note d	Note d	Note d

NOTES:

a. Remove all curbs, ramps, and deck units.
b. Position CRB under bridge min. 1.5 ft (0.5 m) from end.
c. Add LNCG posts, LNCG and nose roller and install launching nose, observing minimum 5 ft (1.5 m) overhang..
d. Disassemble FRB and RRB. Clear site.
** Remove 8th LNH or all of 3N2 (double-story nose).
* Remove given length of launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-11. Delaunch Table - 2E + 18 through 2E + 22 Bay Double Story (w/o LRS) (Normal Site)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E + No of Bays	18	19	20	21	22
L/Nose	8N1	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight	-	[20D+6C]	[20D+6C]	[20D+6Cl	[20D+6C]
V Distance ft m	141 43.0	158.5 48.3	161 49.1	163 49.7	165 50.3
Build	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c
Delaunch Add	15p5 FRB,RRB	16p5 FRB,RRB	17p5 FRB,RRB	18p5 FRB,RRB	19p5 FRB,RRB
Delaunch Recover	(8p4) LRP	(9p0) LRP	(9p7) LRP	(10p3) LRP	(10p7) LRP
Boom Remove (CG)	10p7 E,18 thru 13 (3p7)	11p0 [6C+20D],E 19 thru 14 (4p0)	11p0 [6C+20D],E 20 thru 14 (4p0)	11p0 [6C+20D],E 21 thru 14 (4p0)	11p0 [6C+20D],E 22 thru 14 (4p0)
Boom Remove (CG)	4p5 12 thru 10 (2p3)	4p2 13 thru 10 (2p0)	4p2 13 thru 10 (2p0)	4p2 13 thru 10 (2p0)	4p2 13 thru 10 (2p0)
Boom Remove (CG)	3p0 9 thru 7 (Ap2)	2p4 9 thru 7 (Bp2)	2p4 9 thru 7 (Bp2)	2p4 9 thru 7 (Bp2)	2p4 9 thru 7 (Bp2)
Boom Remove	1p2 6,8N1** 5 7N1*,4 3,2	1p2 6,3N2** 5 4,6N1* 3,2	1p2 6,3N2** 5 4,6N1* 3,2	1p2 6,3N2** 5 4,6N1* 3,2	1p2 6,3N2** 5 4,6N1* 3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete by	Note d	Note d	Note d	Note d	Note

NOTES:

a. Remove all curbs, ramps, and deck units and add counterweight if required.
b. Position CRB under bridge min. 1.5 ft (0.5 m) from end.
c. Add LNCG posts, LNCG and nose roller and install launching nose, observing minimum 5 ft (1.5 m) overhang.
d. Disassemble FRB and RRB. Clear site.
** Remove 8th LNH or all of 3N2 (double-story nose).
* Remove given length of launching nose, LNCG, LNCG posts and nose roller.
[ ] Counterweight.
( ) Center of gravity.

TABLE 6-12. Delaunch Table - 2E + 1 through 2E + 6 Bay Double Story
(Normal Site - Original Far Bank)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5	60 18.3	66 20.1
2E + No. of Bays	1	2	3	4	5	6
L/Nose	2N1	3N1	3N1	3N1	4N1	4N1
V Distance ft m	38 11.6	45 13.7	51 15.5	55.8 17.0	63 19.2	69 21.0
Build,	Notes a,b,c	Notes a,b,d	Notes a,b,d	Notes a,b,d	Notes a, b d,e	Notes a,b, d,e
Delaunch Add	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Delaunch Recover	(1p0) LRP	(1p2) LRP	(1p6) LRP	(2p3) LRP	(2p5) LRP	(3p1) LRP
Boom Remove (CG)	1p3 E (Bp7)	1p6 E (Bp5)	2p4 E (Bp0)	3p0 E (Ap1)	3p0 E (1p2)	4p0 E (1p6)
Boom Remove (CG)						3p0 6,BP5 (1p0)
Boom			1p7	1p7	1p7	1p7
Remove (CG)	2N1* (Bp3)	3N1* Pin at A BP2 (Bp1)	3N1* Pin at A BP3 (Ap2)	BP4 3N1* (1p3)	TP5,BP4 4N1* (1p3)	TP5,BP4 4N1* (1p3)
Boom Remove				2p0 Pin at ’A’	2p0 Pin at ’A’	2p0 Pin at ’A’
Boom Remove			1p4 TP3, BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2
Boom Remove	Bp0 1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete By:	Note f	Note f	Note f	Note f	Note f	Note f

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from end.
b. Position center of LR (LRP) 8 ft (2.4 m) from BSB. Add LNCG posts, LNCG and nose roller.
c. For 2E + 1 only. Add 2 LNH and LLN rear section. Re-position LRP [base 9 in (23 cm) from BSB].
d. For 2E + 2 through 2E + 12. Add 3LNH. Re-position LRP [base 9 in (23 cm) from BSB].
e. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
f. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-13. Delaunch Table - 2E + 7 through 2E + 12 Bay Double Story
(Normal Site - Original Far Bank)

Bridge ft Length m	72 21.9	78 23.8	84 25.6	90 27.4	96 29.3	102 31.1
2E + No. of Bays	7	8	9	10	11	12
L/Nose	4N1	5N1	5N1	5N1	6N1	6N1
V Distance ft (m)	74 (22.6)	81 (24.7)	87 (26.5)	92 (28.0)	99 (30.2)	105 (32.0)
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d
Delaunch Add	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB	Dp2 RRB
Delaunch Recover	(3p6) LRP	(3p7) LRP	(4p3) LRP	(5p0) LRP	(5p2) LRP	(5p6) LRP
Boom Remove (CG)	4p4 E (2p2)	4p6 E (2p5)	4p6 E (2p7)	5p7 E (3p3)	6p1 E (3p7)	6p1 E (4p3)
Boom Remove (CG)				4p6 BP10 (3p3)	4p6 11,BP10 (3p1)	4p6 12,11,BP10 (3p1)
Boom Remove (CG)		3p6 BP8 (2p0)	3p6 9,BP8 (2p0)	3p6 TP10,9 BP8 (2p0)	3p6 TP10,9 BP8 (2p0)	3p6 TP10,9 BP8 (2p0)
Boom Remove (CG)	3p0 7,6 BP5 (1p0)	3p0 TP8,7 BP6 (1p0)	3p0 TP8,7 BP6 (11p0)	3p0 TP8,7 BP6 (11p0)	3p0 TP8,7 BP6 (1p0)	3p0 TP8,7 BP6 (1p0)
Boom Remove (CG)	1p7 TP5,BP4 4N1* (1p3)	1p7 TP6,5 BP4 5N1* (1 p3)	1p7 TP6,5 BP4 5N1* (1p3)	1p7 TP6,5 BP4 5N1* (1 p3)	1p7 TP6,5 BP4 6N1* (1p3)	1p7 TP6,5 BP4 6N1* (1p3)
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3 ,BP2	1p4 TP4 3,BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete By:	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from end.
b. Position center of LR (LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3LNH. Re-position LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, as required observing the minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-14. Delaunch Table - 2E + 13 through 2E + 17 Bay Double Story (w/o LRS)
(Normal Site -Original Far Bank)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E + No of Bays	13	14	15	16	17
L/Nose	6N1	7N1	7N1	7N1	8N1
V Distance ft m	110 33.5	117 35.7	123 37.5	128 39	134.8 41.1
Build	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c	Notes a thru c
Delaunch Add	10p6 FRB,RRB	11p6 FRB,RRB	12p6 FRB,RRB	13p6 FRB,RRB	14p6 FRB,RRB
Delaunch Recover	(6p2) LRP	(6p4) LRP	(7p1) LRP	7p5 LRP	(8p0) LRP
Boom Remove (CG)	6p4 E thru BP12 (4p1)	6p6 E thru BP13 (4p4)	7p3 E thru BP13 (4p4)	7p7 E thru BP13 (4p4)	8p2 E thru BP13 (4p1)
Boom Remove (CG)	4p4 TP12 thru BP9 (2p4)	4p6 TP13 thru BP10 (2p7)	4p6 TP13 thru BP10 (2p7)	4p6 TP13 thru BP10 (2p7)	4p4 TP13 thru BP10 (2p4)
Boom Remove (CG)	2p6 TP9 thru BP6 (1p0)	3pl TP10thruBP7 (1p2)	3pl TP10thruBP7 (1p2)	3pl TP10thruBP7 (1p2)	2p6 TP10thruBP7 (1p0)
Boom Remove (CG)	1p7 TP7 thru BP4 6N1* (1p0)	1p7 TP7 thru BP4 7N1* (1p3)	1p7 TP7 thru BP4 7N1* (1p3)	1p7 TP7 thru BP4 7N1* (1p3)	1p7 TP7 thru BP5 8N1**+BP4 7N1* (1p3)
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Completed by	Note d	Note d	Note d	Note d	Note d

NOTES:

a. Remove all curbs, ramps, and deck units.
b. Position CRB under bridge min 1.5 ft (0.5 m) from the end
c. Add LNCG posts, LNCG and nose roller and install launching nose, observing minimum 5 ft (1.5 m) overhang.
d. Disassemble FRB and RRB. Clear site.
** Remove 8th LNH (after BP5), or all of 3N2 (after BP6).
* Remove given length of launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-15. Delaunch Table - 2E + 18 through 2E + 22 Bay Double Story (w/o LRS)
(Normal Site - Original Far Bank)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E + No of Bays L/Nose	18 8N1	19 6N1+3N2	20 6N1+3N2	21 6N1+3N2	22 6N1+3N2
Counterweight	-	[20D+6C]	[20D+6C]	[20D+6C]	[20D+6C]
V Distance ft m	141 43.0	158.5 48.3	161 49.1	163 49.7	165 50.3
Build	notes a thru c	notes a thru c	notes a thru c	notes a thru c	notes a thru c
Delaunch Add	15p5 FRB+RRB	16p5 FRB+RRB	17p5 FRB+RRB	18p5 FRB+RRB	19p5 FRB+RRB
Delaunch Recover	(8p4) LRP	(9p0) LRP	(9p7) LRP	(10p3) LRP	(10p7) LRP
Boom Remove (CG)	8p6 E thru BP13 (4pl)	9p2 [6C+20D] E thru BP13 (3p6)	10p1 [6C+20D] E thru BP1 3 (3p6)	10p5 [6C+20D] E thru BP13 (3p6)	11p1 [6C+20D] E thru BP13 (3p6)
Boom Remove (CG)	4p4 TP13 thru BP10 (2p4)	4p0 TP13 thru BP10 (2p2)	4p0 TP13 thru BP10 (2p2)	4p0 TP13 thru BP10 (2p2)	4p0 TP13 thru BP 10 (2p2)
Boom	2p6	2p4	2p4	2p4	2p4
Remove (CG)	TP10 thru BP7 (1p0)	TP10 thru BP7 (Bp0)	TP10 thru BP7 (Bp0)	TP10 thru BP7 (Bp0)	TP10 thru BP7 (Bp0)
Boom Remove 7N1'* (CG)	1p7 TP7 thru BP5 8N1**+BP4 TP6 thru BP4 (1p3)	1p7 TP7+BP6 3N2** TP6 thru BP4 6N1* (1p3)	1p7 TP7+BP6 3N2** TP6 thru BP4 6N1* (1p3)	1p7 TP7+BP6 3N2** TP6 thru BP4 6N1* (1p3)	1p7 TP7+BP6 3N2** 6N1* (1p3)
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2	1p4 TP4 thru BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Completed by	Note d	Note d	Note d	Note d	Note d

NOTES:

a. Remove all curbs, ramps, and deck units and add counterweight if required.
b. Position CRB under bridge min 1.5 ft (0.5 m) from the end
c. Add LNCG posts, LNCG and nose roller and install launching nose, observing minimum 5 ft (1.5 m) overhang.
d. Disassemble FRB and RRB. Clear site.
** Remove 8th LNH (after BP5), or all of 3N2 (after BP6).
* Remove given length of launching nose, LNCG, LNCG posts and nose roller.
[ ] Counterweight.
( ) Center of gravity.

TABLE 6-16. Delaunch Table - 2E + 1 through 2E + 4 Bay Double Story
(Restricted Site)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5	
2E + No. of Bays	1	2	3	4	
L/Nose	3N1	4N1	4N1	4N1	5N1
V Distance ft	39	45	51	57	63
m	11.9	13.7	15.5	17.4	19.2
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d
Delaunch Remove	1p4 E	2p4 E	3p4 E	4p4 E	4p4 E
Delaunch Remove			2p4 3		3p4 4
Delaunch Remove					2p4 3
Delaunch Add	Bp1 RRB	1p4 RRB	1p4 RRB	2p4 RRB	1p4 RRB
Delaunch Recover	(Cp1) LRP	(Bp7) LRP	(Bp7) LRP	(Ap2) LRP	(Cp1) LRP
Boom Remove (CG)				2p4 4 (Bp2)	
Boom Remove				1p7 3 (Bp7)	
Boom Remove	1p3 3N1*	1p6 4N1* 2	1p2 4N1* 2	1p2 4N1* 2	1p2 5N1* 2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from the end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-17. Delaunch Table - 2E + 5 through 2E + 6 Bay Double Story (Restricted Site)

Bridge ft Length m	60 18.3		66 20.1	
2E + No. of Bays	5		6	
L/Nose	5N1	6N1	5N1	6N1
V Distance ft m	63 19.2	63 19.2	69 21.0	69 21.0
Build	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d
Delaunch Remove	5p4 E	5p4 E	6p4 E	6p4 E
Delaunch Remove	4p4 5	4p4 5	5p4 6	5p4 6
Delaunch Remove		3p4 4		4p4 5
Delaunch Remove		2p4 3		3p4 4
Delaunch Remove				2p4 3
Delaunch Add	2p4 RRB	1p4 RRB	3p4 RRB	1p4 RRB
Delaunch Recover	(Bp0) LRP	(Cp4) LRP	(1p0) LRP	(Cp4) LRP
Boom Remove (CG)	2p2 4		2p6 5 (Bp0)	
Boom Remove (CG)	1p5 3 (Cp1)		2p4 4 (Bp4)	
Boom Remove	1p2 5N1* 2	1p2 6N1* 2	1p2 5N1* 3,2	1p2 6N1* 2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from the end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-18. Delaunch Table - 2E + 7 through 2E + 9 Bay Double Story (Restricted Site)

Bridge ft Length m	72 21.9		78 23.8			84 25.6
2E + No. of Bays	7		8			9
L/Nose	5N1	6N1	6N1	7N1	6N1	7N1
V Distance ft (m)	75 (22.9)	75 (22.9)	81 (24.7)	81 (24.7)	87 (26.5)	87 (26.5)
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d
Delaunch Remove	7p4 E	7p4 E	8p4 E	8p4 E	9p4 E	9p4 E
Delaunch Remove		6p4 7	7p4 8	7p4 8	8p4 9	8p4 9
Delaunch Remove		5p4	6p4 6	6p4 7	7	7p4 8
Delaunch Remove		4p4 5		5p4 6		6p4 7
Delaunch Remove				4p4 5		5p4 6
Delaunch Add	5p4 RRB	2p4 RRB	4p4 RRB	2p4 RRB	6p4 RRB	3p4 RRB
Delaunch Recover	(2p0) LRP	(Bp2) LRP	(1p2) LRP	(Bp5) LRP	(2p3) LRP	(Bp0) LRP
Boom Remove (CG)	3p7 7 (1p4)	1p7 4 (Bp7)	3p0 6 (Ap2)		4p0 8 (1p6)	2p1 5 (Bp5)
Boom Remove (CG)	3p2 6 (1p0)		2p4 5 (Bp2)		3p4 7 (1p2)	
Boom Remove (CG)	2p2 5,4 (Bp4)		1p7 4 (Bp7)		3p0 6 (Ap2)	
Boom Remove (CG)						1p7 5 and 4 (Bp7)
Boom Remove	1p2 5N1*,3,2	1p2 6N1*,3,2	1p2 6N1*,3,2	1p2 4,7N1*,3,2	1p2 6N1*,3,2	1p2 4,7N1*,3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from the end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-19. Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
V Distance ft	93	93	99	99	105	105
m	28.3	28.3	30.2	30.2	32.0	32.0
Build	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d	Notes a,b, c and d
Delaunch Remove	10p4 E	10p4 E	11p4 E	11p4 E	12p4 E	12p4 E
Delaunch Remove		9p4 10	10p4 11	10p4 11	11p4 12	11p4 12
Delaunch Remove		8p4 9	9p4 10	9p4 10		 11
Delaunch Remove		7p4 8		8p4 9		9p4 10
Delaunch Remove				7p4 8		8p4 9
Delaunch Remove					6p4 7	
Delaunch Add	8p4 RRB	5p4 RRB	7p4 RRB	4p4 RRB	9p4 RRB	6p4 RRB
Delaunch Recover	(3p3) LRP	(lp4) LRP	(2p5) LRP	(Ap2) LRP	(3p5) LRP	(1p6) LRP
Boom Remove (CG)	5p1 10 (2p7)	3p2 7 (1p0)	4p2 9 (2p1)	2p3 6 (Bp3)	5p3 11 (3p1)	3p4 8 (1p2)
Boom Remove (CG)	4p4 9 (2p3)	2p6 6 (Bp0)	3p6 8 (1p4)	lp6 5 (Cp0)	4p7 10 (2p5)	3p0 7 (Ap2)
Boom Remove (CG)	4p0 8 (1p6)	2p1 5 (Bp5)	2p6 7,6 (Bp0)		3p6 9,8 (1p4)	2p3 6 (Bp3)
Boom Remove (CG)	3p0 7,6 (Ap2)			 (Cp2)	2p6 7,6 (Cp0)	1p6 5
Boom Remove (CG)	1p7 5,4 (Bp7)					

TABLE 6-19. (cont'd) Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story (Restricted Site)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
V Distance ft m	93 28.3	93 28.3	99 30.2	99 30.2	105 32.0	105 32.0
Boom Remove (CG) Remove	1p2 6N1* 3,2	1p2 4 (Cp2) 7N1* 3,2	1p2 5,4 (Cp2) 7N1* 3,2	1p2 8N1+4 (Cp2) 7N1* 3,2	1p2 5,4 (Cp2) 7N1* 3,2	1p2 8N1+4 (Cp2) 7N1* 3,2
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete By:	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from the end.
b. Position center of LR (in LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3 LNH. Reposition LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-20. Delaunch Table - 2E + 1 through 2E + 5 Bay Double Story
(Restricted Site - Original Far Bank)

Bridge ft Length m	36 11.0	42 12.8	48 14.6	54 16.5		60 18.3	
2E + No. Bays	1	2	3	4		5	
L/Nose	3N1	4N1	4N1	4N1	5N1	5N1	6N1
V Dist. ft (m)	39 (11.9)	45 (13.7)	51 (15.5)	57 (17.4)	57 (17.4)	63 (19.2)	63 (19.2)
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a b,c,d	Notes a,b,c,d
Delaunch Remove		2p4 BSB,ETP TPF,TPE	3p4 BSB,ETP TPF,TPE	4p4 BSB,ETP TPF,TPE	4p4 BSB,ETP TPF,TPE	5p4 BSB,ETP TPF,TPE	5p4 BSB,ETP TPF,TPE
Delaunch Remove			2p4 D,BP3	3p4 D,BP4	3p4 D,BP4	4p4 D,BP5	4p4 D,BP5
Delaunch Remove					Ap1 TP4,BP3		1p7 TP5,BP4
Delaunch Remove							Ap1 TP4,BP3
Delaunch Add	 RRB	Ap3 RRB	Ap3 RRB	1p6 RRB	 RRB	1p4 RRB	 RRB
Delaunch Recover	(Ap2) LRP	(Bp4) LRP	(Bp5) LRP	(Bp0) LRP	(Bp7) LRP	(Ap2) LRP	(Cp2) LRP
Boom Remove, (CG)	Dp1 BSB,ETP TPF,TPE (BP6)					2p2 TP5,BP4 (Bp3)	
Boom Remove (CG)	1p4 3N1* (Bp1)	1p7 4N1* (Ap1)	1p7 4N1* (Ap2)	1p7 4N1* (1 p3)	1p4 5N1* (Ap2)	1p5 5N1* (lp3)	1p4 6N1* (lp3)
Boom Remove	Dp2 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1lp2 D	1p4 D,BP2	1p4 3TP3,BP2	1p4 TP4,3 BP2	1p4 TP3,BP2	1p4 TP4,3 BP2	1p4 TP3,BP2
Boom Remove	Bp0 1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete by	Note e	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from end.
b. Position center of LR (LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3LNH. Re-position LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections, observing minimum 5 ft (1.5 m) overhang.
f. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-21. Delaunch Table - 2E + 6 through 2E + 9 Bay Double Story
(Restricted Site -Original Far Bank)

Bridge ft	66		72		78		84	
Length m	20.1		24.9		23.8		25.6	
2E + No. Bays	6		7		8		9	
L/Nose	5N1	6N1	5N1	6N1	6N1	7N1	6N1	7N1
V Distance ft	69	69	75	75	81	81	87	87
m	21.0	21.0	22.9	22.9	24.7	24.7	26.5	26.5
Build	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a,b,c,d	Notes a b,c,d	Notes a,b,c,d	Notes a,b,c,d
Delaunch Remove	6p4 BSB ETP TPF,TPE	6p4 BSB ETP TPF,TPE	7p4 BSB ETP TPF,TPE	7p4 BSB ETP TPF,TPE	8p4 BSB ETP TPF,TPE	8p4 BSB ETP TPF,TPE	9p4 BSB ETP TPF,TPE	9p4 BSB ETP TPF,TPE
Delaunch Remove	5p4 D,BP6	5p4 D,BP6	6p4 D,BP7	6p4 D,BP7	7p4 D,BP8	7p4 D,BP8	8p4 D,BP9	8p4 D,BP9
Delaunch Remove		2p7 TP6,BP5		3p7 TP7,BP6	4p7 TP8,BP7	4p7 TP9,BP8		5p7 TP8,BP7
Delaunch Remove		1p7 TP5,BP4		2p7 TP6,BP5		3p7 TP7,BP6		4p7 TP8,BP7
Delaunch Remove		Ap1 TP4,BP3				2p7 TP6,BP5		3p7 TP7,BP6
Delaunch Add	2p0 RRB	RRB	3p0 RRB	RRB	2p2 RRB	RRB	3p3 RRB	RRB
Delaunch Recover	(1p2) LRP	(Cp2) LRP	(1p6) LRP	(Bp0) LRP	(1p4) LRP	(Bp3) LRP	(2p5) LRP	(Ap2) LRP
Boom Remove (CG)	2p6 TP6,BP5 (Ap2)				3p0 TP7,BP6 (1p0)		4p0 TP9,BP8 (1p6)	2p1 TP6,BP5 (Bp3)
Boom Remove (CG)	2p2 TP5,BP4 (Bp3)		3p2 TP7,BP6 (1p2)		2p4 TP6,BP5 (Bp0)		3p4 TP8,BP7 (1p2)	
Boom Remove (CG)			2p2 TP6,BP5 (Ap2)				3p0 TP7,BP6 (Ap2)	

TABLE 6-21. (cont'd) Delaunch Table - 2E + 6 through 2E + 9 Bay Double Story
(Restricted Site-Original Far Bank)

Bridge ft Length m	66 20.1		72 21.9		78 23.8		84 25.6	
2E + No. Bays	6		7		8		9	
L/Nose	5N1	6N1	5N1	6N1	6N1	7N1	6N1	7N1
V Distance ft m	69 21.0	69 21.0	75 22.9	75 22.9	81 24.7	81 24.7	87 26.5	87 26.5
Boom Remove (CG)	1p7 5N1* (1p3)	1p4 6N1* (Ap2)	1p7 TP5,BP4 5N1* (1p3)	1p7 TP5,BP4 6N1* (1p3)	1p7 TP5,BP4 6N1* (1p3)	1p7 TP5,BP4 7N1* (1p3)	1p7 TP6,BP5 TP5,BP4 6N1* (1p3)	1p7 TP5,BP4 7N1* (1p3)
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4 3,BP2	1 p4 TP4 3,BP2	1 p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1 p4 TP4 3,BP2	1 p4 TP4 3,BP2	1p4 TP4 3,BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete by	Note e	Note e	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from end.
b. Position center of LR (LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3LNH. Re-position LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections as required, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 6-22. Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story
(Restricted Site - Original Far Bank)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
V Distance ft m	93 28.3	93 28.3	99 30.2	99 30.2	105 32.0	105 32.0
Build	Notes a, b, c,d	Notes a, b, c,d	Notes a, b, c,d	Notes a, b, c,d	Notes a, b, c,d	Notes a, b, c,d
Delaunch Remove	10p4 BSB,ETP, TPF,TPE	10p4 BSB,ETP, TPF,TPE	11 p4 BSB,ETP, TPF,TPE	11p4 BSB,ETP, TPF,TPE	12p4 BSB,ETP, TPF,TPE	12p4 BSB,ETP, TPF,TPE
Delaunch Remove	9p4 D,BP10	9p4 D,BP10	10p4 D, D,BP10	10p4 D,BP11	11p4 D,BP12	11p4 D,BP12
Delaunch Remove		6p7 TP10,BP9	7p7 TP11,BP1 0	7p7 TP11,BP10		8p7 TP12,BP11
Delaunch Remove		5p7 TP9,BP8		6p7 TP10,BP9		7p7 TP11,BP10
Delaunch Remove				5p7 TP9,BP8		6p7 TP10,BP9
Delaunch Remove				4p7 TP8,BP7		
Delaunch Add	4p3 RRB	RRB	3p5 RRB	RRB	4p5 RRB	RRB
Delaunch Recover	(3p1) LRP	(1p6) LRP	(2p7) LRP	(1p0) LRP	(3p7) LRP	(2p0) LRP
Boom Remove (CG)		3p2 TP8,BP7 (1p2)	4p2 TP10,BP9 (2p3)	2p3 TP7,BP6 (Bp1)	5p3 TP12,BP11 (3p3)	3p4 TP9,BP8 (1p4)
Boom Remove (CG)	4p4 TP10,BP9 (2p5)	2p6 TP7,BP6 (Ap2)	3p6 TP9,BP8 (1p6)		4p7 TP11,BP10 (2p7)	3p0 TP8,BP7 (1p0)
Boom Remove (CG)	4p0 TP9,BP8 (2p0)	2p1 TP6,BP5 (Bp3)	2p6 TP8,BP7 (1p2)		3p6 TP10,BP9 (2p3)	2p3 TP7,BP6 (Bp1)

TABLE 6-22. (cont'd) Delaunch Table - 2E + 10 through 2E + 12 Bay Double Story
(Restricted Site - Original Far Bank)

Bridge ft Length m	90 27.4		96 29.3		102 31.1	
2E + No. of Bays	10		11		12	
L/Nose	6N1	7N1	7N1	8N1	7N1	8N1
V Distance ft m	93 28.3	93 28.3	99 30.2	99 30.2	105 32.0	105 32.0
Boom Remove (CG)	3p0 TP8,BP7 TP7,BP6 (1p0)					2p6 TP8 and BP7 (1p2)
Boom Remove (CG)	1p7 TP6,BP5 TP5,BP4 6N1 (1p3)	1p7 TP5,BP4 7N1* (1p3)	1p7 TP7,BP6 TP6,BP5 TP5,BP4 7N1* (1p3)	1p7 TP6,BP5 8N1,TP5 BP4,7N1 (1p3)	1p7 TP7,BP6 TP6,BP5 TP5,BP4 7N1* (1p3)	1p7 TP6,BP5 8N1,TP5 BP4,7N1 (1p3)
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2	1p4 TP4 3,BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete by	Note e	Note e	Note e	Note e	Note e	Note e

NOTES:

a. Remove curbs, decks and ramps and position FRB under bridge min 1.5 ft (0.5 m) from end.
b. Position center of LR (LRP) 8 ft (2.4 m) from BSB.
c. Add LNCG posts, LNCG and nose roller. Add 3LNH. Re-position LRP [base 9 in (23 cm) from BSB].
d. Add remaining nose sections as required, observing minimum 5 ft (1.5 m) overhang.
e. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

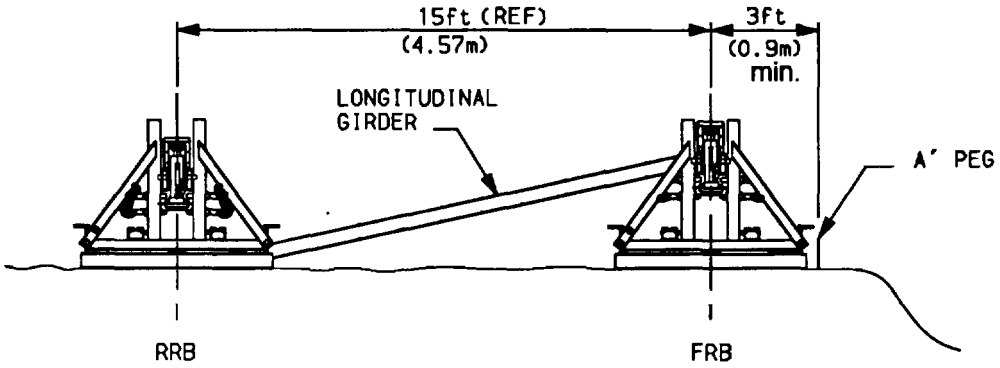
Section II. NORMAL SITES

6-1. ASSEMBLY- DOUBLE STORY - 2E + 12 BAY

a. Set up and align roller beams

(1) Assemble front roller beam (FRB) and rear roller beam (RRB) and position on site (para. 4-5b.).

(2) Ensure roller beams are level.

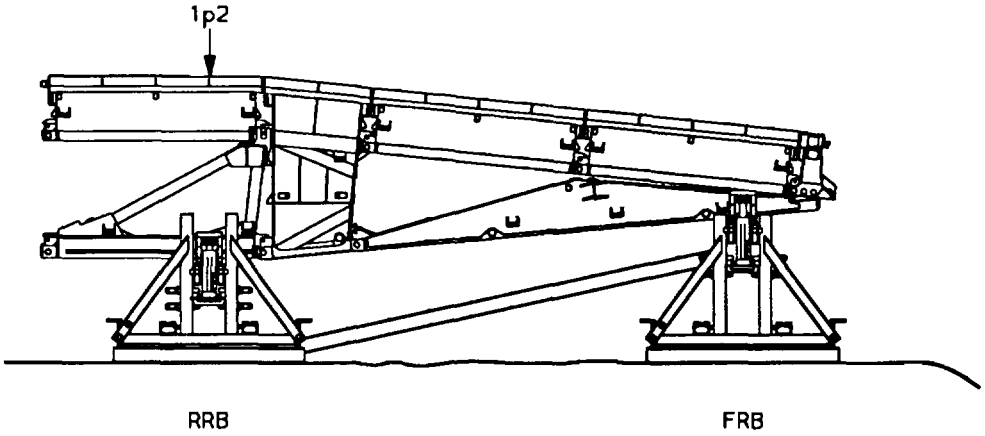


b. Assembly

NOTE

Throughout bridge assembly the NCOIC must monitor the height and level of roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Assemble end of bridge (EOB) and first bay (para. 4-8).



(2) Position extended jack vertically in Mk1 landing roller pedestal and place closed landing roller pedestal and landing roller next to front roller beam.

(3) Fit nose roller to bankseat beam (para. 4-10).

(4) Fit nose cross girder posts to junction panels (para. 4-11b.).

(5) Fit nose cross girder to post at correct height and put retainer clips through the end of captive pins (para. 4-11c.).

(6) Add bays 2 and 3. Do not add sway braces.

(7) Assemble launching nose (6N1) with landing roller pedestal (para. 4-12b.).

(8) Place one deck unit in the third deck recess of bay 1. Pin sway braces in bays 1,2 and 3.

(9) Add bays 4 and 5. Add sway braces to bays 4 and 5.

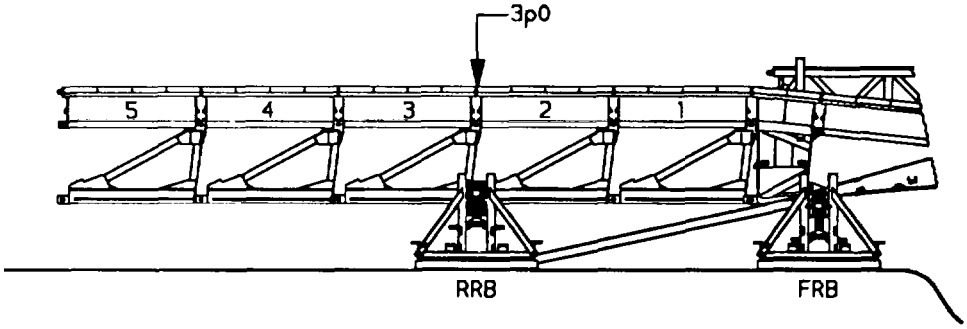
CAUTION

The following cautions should be observed each time the bridge Is boomed. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

NOTE

Throughout the build the bridge Is boomed using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

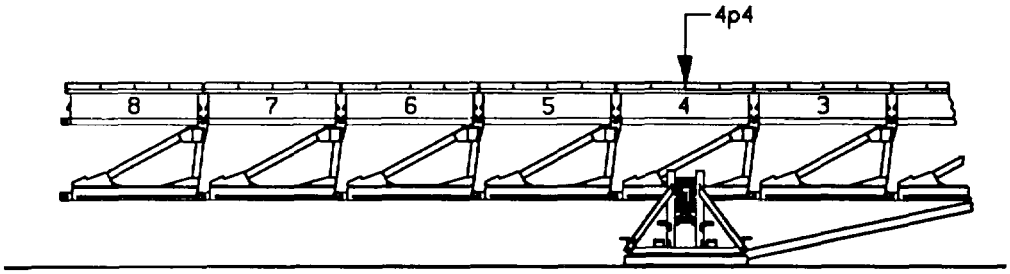
(10) Connect push bar. Unlock rollers and boom bridge to panel point 3p0 (over RRB). Lock rollers, and disconnect push bar.



(11) Add bays 6, 7 and 8. Add sway braces to bays 6, 7 and 8.

(12) Place one deck unit in the third deck recess of bay 7. Placement of deck unit in bay 7 will keep girders of bridge spaced at correct distance.

(13) Connect push bar. Unlock rollers. Boom bridge to panel point 4p4 (over RRB). Lock rollers, and disconnect push bar.



(14) Add bays 9, 10 and 11. Include sway braces in each bay. Adjust roller beams as necessary to maintain bridge level.

(15) Place one deck unit in third recess of bay 11.

(16) Connect push bar. Unlock rollers. Using vehicle boom bridge to panel point 6p1 (over RRB). Lock rollers, and disconnect push bar.

(17) Add bay 12. Add sway brace in bay 12.

(18) Complete end of bridge (para. 4-9b.).

NOTE

The launch of all bridges will be done with a vehicle. Once this vehicle Is connected to the bridge, It will not be disconnected until the far bank end of bridge has been lowered to the ground.

(19) Connect short push bar to center bracket of bankseat beam with nose pin (para. 4-18c.).

(20) Move vehicle into position near rear of bridge. Ensure that vehicle is in a straight line with the bridge and centered over the centerline.

(21) Connect push bar to adapter with bracing pin and secure pin with retainer clip.

(22) Unlock rollers and launch bridge to panel point 5p6 over front roller beam. This puts the center of gravity over the front roller beam.

(23) Do not lock rollers. The vehicle is used to hold the bridge in place.

(24) Set up landing roller pedestal (para. 4-15a.) Mk1 on far bank and check that LZ5 or higher is over center of LRP rollers (para. 4-4).

CAUTION

A landing zone number higher than the given LZ Is always permitted. Never use an LZ number lower than that given for the bridge being constructed.

(25) Continue launch until panel point Dp2 is over front roller beam.

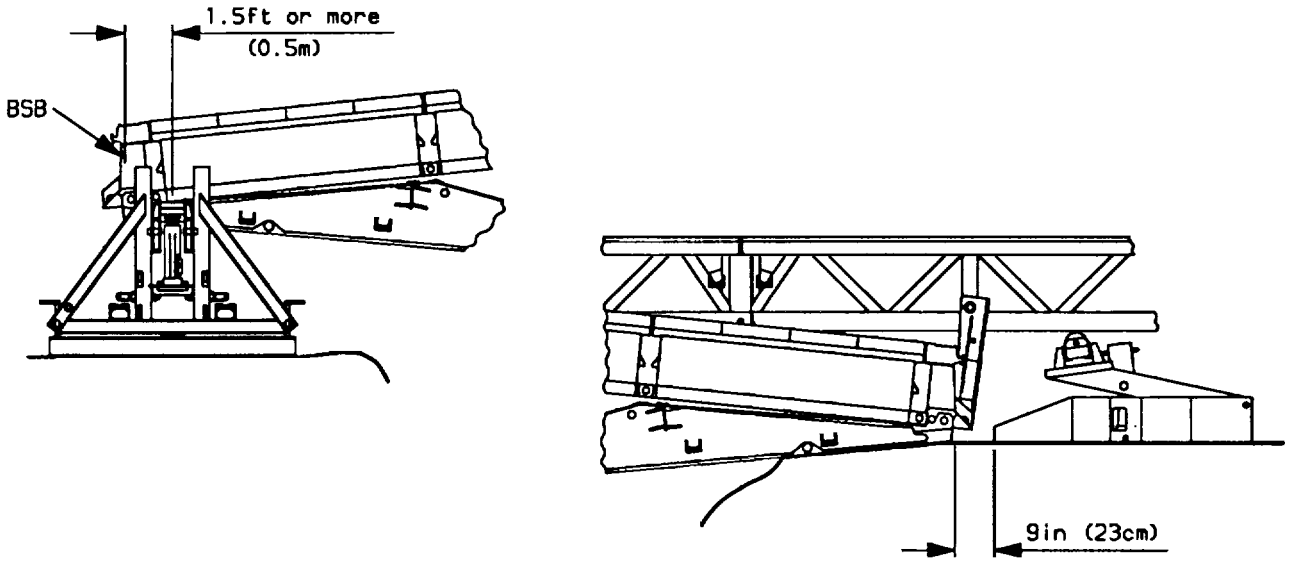
NOTE

Nose sections (light and heavy) can be removed during launch after they have passed the center of the landing roller. It Is important to remember that at least 5 ft (1.5 m) of nose section must extend beyond the landing roller pedestal at all times.

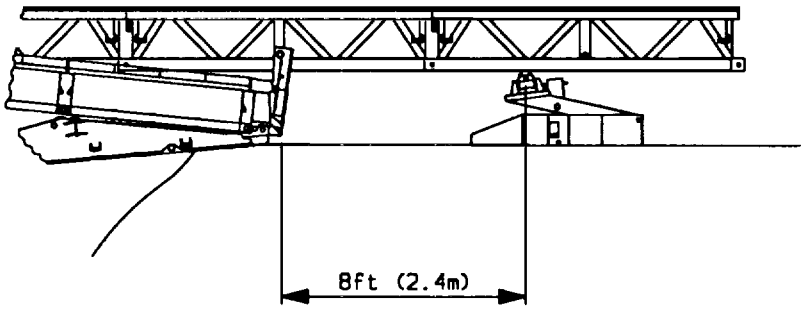
(26) Remove nose sections that have passed the landing roller pedestal. Leave the last three nose sections in place. These sections will be removed after the far bank end of bridge has been lowered to the ground.

(27) Disassemble rear roller beam. Do not allow personnel to work under bridge.

(28) Continue launch until the far bank bankseat beam is within 9 in (23 cm) of landing roller pedestal base. The near bank end of bridge should be 1.5 ft (0.5 m) or greater from center of the front roller beam rollers.



(29) Lower far bank end of bridge by operating jack in landing roller pedestal. Reposition landing roller pedestal so the center of roller is 8 ft (2.4 m) from nose roller on bankseat beam. Raise landing roller pedestal until roller touches bottom of launching nose.



(30) Disconnect vehicle and push bar from bridge.

(31) Remove remaining launching nose heavy sections (para. 4-13a.) and launching nose roller.

(32) Remove launching nose cross girder and nose cross girder posts (para. 4-11).

(33) Lower near bank end of bridge using jacks (para. 4-20f.), davits (para. 4-21) or crane (para. 4-22).

(34) If approach surface is to be improved, do so at this time.

(35) Hook seven long ramp units to near bankseat beam. Ensure anti-lift lugs are engaged (para. 4-24).

(36) Lay decking, starting on near bank end of bridge (para. 4-25).

(37) If exit surface is to be improved, do so at this time.

(38) Hook seven long ramp units to far bankseat beam. Ensure anti lift-lugs are engaged.

(39) Fit curbs, starting on near bank end of bridge (para. 4-26).

(40) Put bridge guide markers in place (para. 4-26).

(41) After bridge has passed inspection, put bridge classification signs in place.

(42) Make sure all erection equipment is away from roadway. The bridge is now ready for use.

6-2. DISASSEMBLY-DOUBLE-2E + 12 BAY

a. Preparation for Disassembly

(1) If pumps, hoses and water are available, the bridge and erection components should be washed before loading them on pallets.

(2) If washing cannot be done, the components are loaded directly onto the proper pallet.

b. Disassembly

NOTE

Throughout bridge disassembly the NCOIC must monitor the height and level of roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Remove bridge classification signs, bridge guide markers and curbs (reverse of para. 4-26).

(2) Remove far bank ramp units, removing center ramp first (reverse of para. 4-24).

(3) Remove deck units (reverse of para. 4-25), starting on the far bank end of bridge. Leave a deck unit in the third recess of bays 1, 7 and 11.

(4) Add launching nose cross girder posts (para. 4-11b), then install launching nose cross girder onto posts at required height (para. 4-11c).

(5) Remove near bank ramp units, removing center ramp first (reverse of para. 4-24).

(6) Raise near bank end of bridge high enough to install front roller beam (FRB), using jacks, davits or crane.

(7) Lower bridge onto packing.

(8) Assemble front roller beam, and slide it under rear of bridge. Center front roller beam under bridge at least 1.5 ft (0.5 m) from end of end taper panel.

(a) Ensure front roller beam is over centerline of bridge. Center of front roller beam must be directly over front roller beam peg.

(b) Ensure front roller beam is at right angle (900) to centerline of bridge.

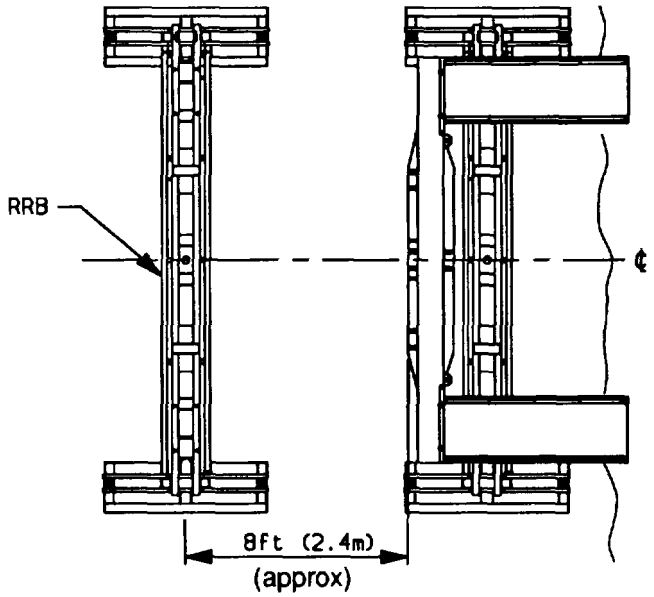
(c) Lock rollers.

(9) Operate jacks in roller beam until weight of bridge is on roller beam and off packing.

(10) Remove packing.

(11) Position roller beam at required height for delaunch. Use carpenter's level to level roller beam.

(12) Assemble rear roller beam (RRB) and position over centerline approx 8 ft (2.4 m) from bankseat beam.



(13) Move vehicle into position about 15 ft (4.6 m) from end of bridge. Ensure vehicle is in line with bridge and centered over centerline.

(14) Connect vehicle to bridge with short push bar (para. 4-18c.).

NOTE

The bridge will be held in position by the vehicle and locked rollers of roller beam during assembly of launching nose.

(15) Connect launching nose roller to far bank bankseat beam (para. 4-10).

(16) Assemble launching nose (para. 4-14a.).

(17) Using landing roller pedestal, raise bridge off ground until jack is fully extended.

(18) Unlock front roller beam rollers.

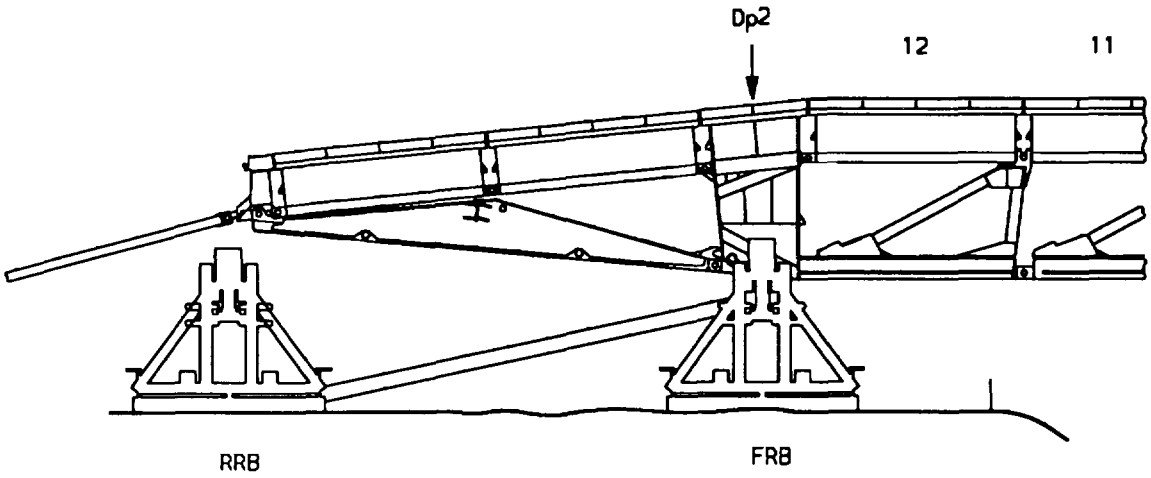
CAUTION

The following cautions should be observed each time the bridge Is de- launched. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

(19) Delaunch bridge until Dp2 is over center of front roller beam.

(20) Do not disconnect vehicle from bridge.

(21) Slide rear roller beam toward bankseat beam to fit longitudinal girders. Position roller beam using longitudinal girders, then disconnect girders from RRB and place on the ground.

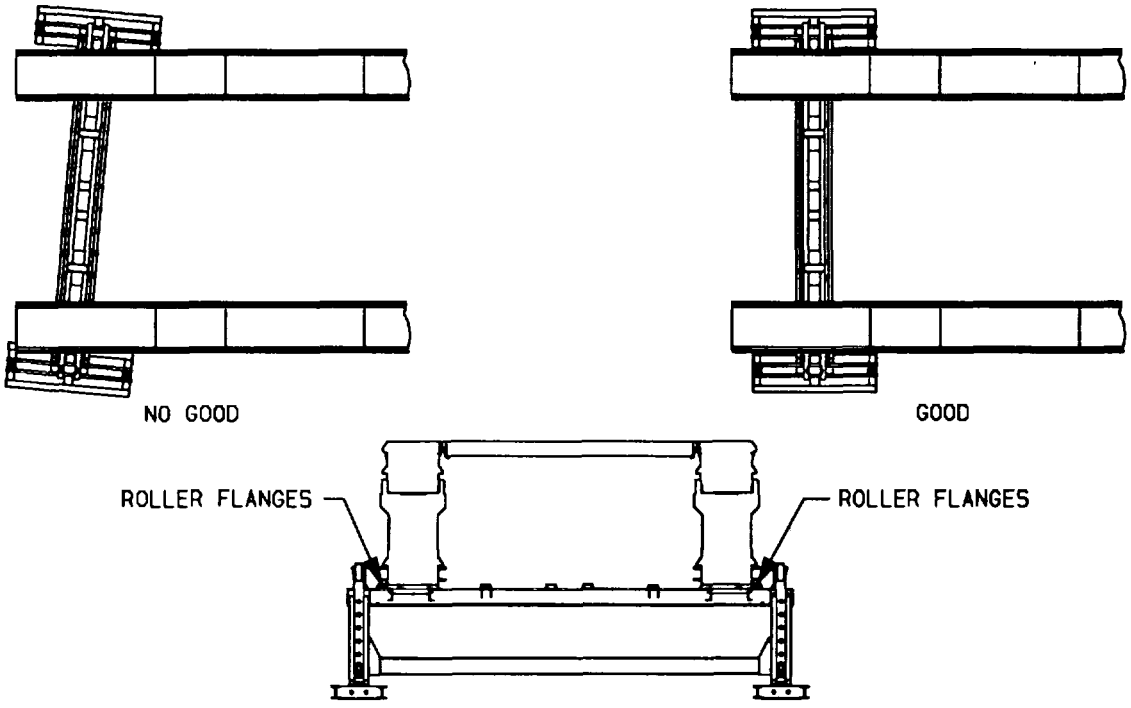


(22) Unlock rollers in rear roller beam.

(23) Delaunch to 5p6 (over FRB).

NOTE

The center of gravity of bridge is over the front roller beam. It is at this point that any minor adjustments in the rear roller beam placement must be made. Ensure that bridge will come to rest on rear roller beam correctly. The bridge should rest between flanges of rollers, not on top of them. The rear roller beam must be at 90° to bridge centerline.



(24) Hold rear of bridge down on front roller beam and rear roller beam.

(25) Lower jack in landing roller pedestal. Remove landing roller pedestal from under launching nose and remove jack.

(26) Recover landing roller pedestal (para. 4-15c.).

(27) Unlock rollers and boom to 6pl over rear roller beam. Lock rollers, and disconnect push bar (para. 4-18e.).

(28) Level both roller beams using carpenter's level.

(29) Remove sway braces from end of bridge.

(30) Disassemble end of bridge (reverse of para. 4-9b)

(31) Remove bay 12.

CAUTION

The following cautions should be observed each time the bridge is delaunched. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge movement of bridge to right or left can cause damage to roller beams.

NOTE

Throughout disassembly the bridge is delaunched using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are removed. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(32) Connect push bar and boom to panel point 4p4 (over RRB). Lock rollers. Disconnect push bar.

(33) Remove deck unit in bay 11 and remove bays 11, 10 and 9.

(34) Connect push bar. Unlock rollers and boom to 3p0 over rear roller beam. Lock rollers, and disconnect push bar.

(35) Remove deck unit in bay 7 and remove bays 8, 7 and 6.

(36) Connect push bar. Unlock rollers and boom to 1 p2 over rear roller beam. Lock rollers, and disconnect push bar.

(37) Remove bays 5 and 4.

(38) To remove sixth nose section (6N1):

(a) Remove retainer clip from panel pin in nose roller and anchorage tube.

(b) With center crew prepared to move launching nose to rear of site, remove panel pin from nose roller.

(c) Lift gravity catch and move launching nose to rear until next anchorage tube is next to nose roller.

1 If nose is uphill, move nose forward until center vertical is in front of nose roller. Put panel pin through nose roller and behind center vertical.
2 If nose is downhill, move nose to rear until center vertical is behind nose roller. Put panel pin through nose roller and in front of center vertical.

(d) Remove nose section (6N1).

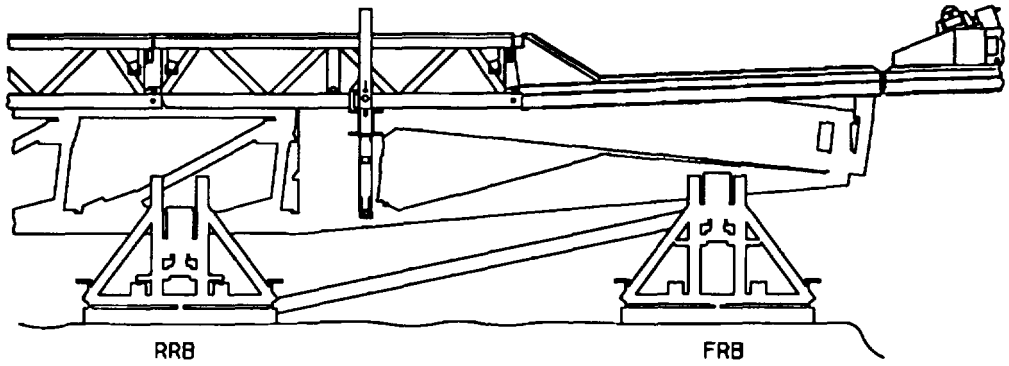
(39) Use same method [as step (38)] to remove 5N1, 4N1 and 3N1.

(40) To remove 2N1:

(a) With center crew prepared to move launching nose to rear of site, remove panel pin from nose roller.

(b) Lift gravity catch and move launching nose to rear until junction of LLN front and LLN rear is just gap side of nose roller.

(c) Put panel pin through nose section against launching nose cross girder rollers. If tip of nose is uphill, place pin in front of rollers. If tip of nose is downhill, place pin behind rollers.



(d) Remove 2N1.

(41) Remove landing roller pedestal from launching nose.

(42) Move launching nose until rear of light launching nose rear is over launching nose cross girder. Personnel must support launching nose heavy.

(43) Remove last launching nose heavy.

(44) Remove light launching nose from nose roller and launching nose cross girder, then disassemble light launching nose.

(45) Remove nose roller from bankseat beam (reverse of para. 4-10).

(46) Remove launching nose cross girder and posts (para. 4-11b).

(47) Remove bays 3 and 2 and deck unit from bay 1.

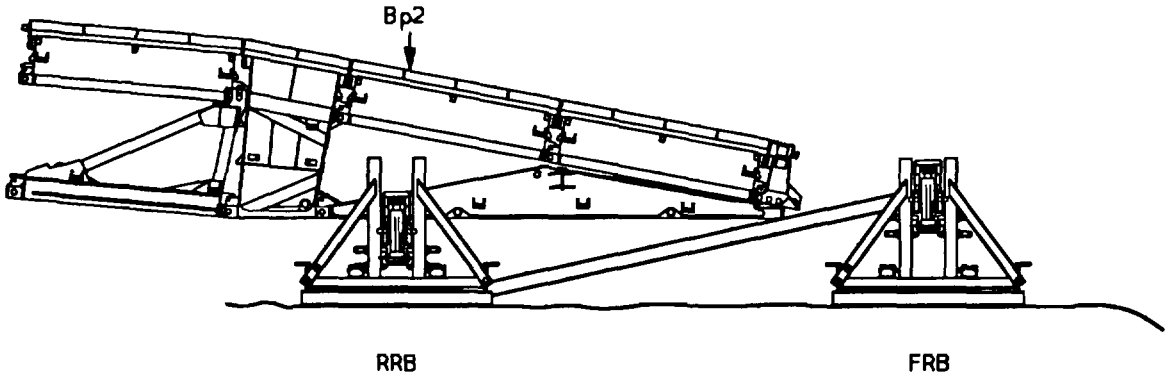
(48) Position 16 personnel (right and left side crews) around end of bridge.

(49) Unlock roller beam rollers.

CAUTION

It is necessary to lift the end of bridge off the front roller beam rollers and back onto longitudinal girder. Do not allow bridge to drop onto longitudinal girder.

(50) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(51) Lock rollers. Disassemble last bay and end of bridge (reverse of para. 4-8).

(52) Disassemble roller beams.

(53) Clear site.

6-3. DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Normal Site - Original Far Bank)

a. General

This paragraph provides only the additional or modified steps needed to disassemble the 2E + 12 bay MGB on the original far bank. The operator must be familiar with, or refer to, the General Drills (Chapter 4) and Disassembly Double Story 2E + 12 bay, near bank (para. 6-2).

NOTE

The original far bank becomes the new near bank, and the original near bank becomes the new far bank. Also the bays of the bridge must be renumbered from the new far bank. Using a 2E + 12 Bay as an example, what was bay 12 is now bay 1, and what was bay 1 is now bay 12.

All reference to near or far bank from this point will be referring to the new near bank and the new far bank.

Move all launching nose components to the far bank, and all the roller beam components to near bank. All pallets must be moved to near bank.

b. Disassembly

(1) Perform steps a. (1) and (2) and b. (1) thru (5) in paragraph 62.

(2) If bridge has been emplaced with minimum bearing under the original far bank (now near bank), it will be necessary to "skid" the bridge to get 4.5 ft (1.4 m) over the bank so that front roller beam can be put under it safely.

(a) Raise near bank end of bridge and lower onto timbers. The surface of the timbers next to the bridge girder must be wet or smeared with grease.

(b) Assemble first three launching nose heavy sections.

(c) Position landing roller pedestal next to far bank bankseat beam.

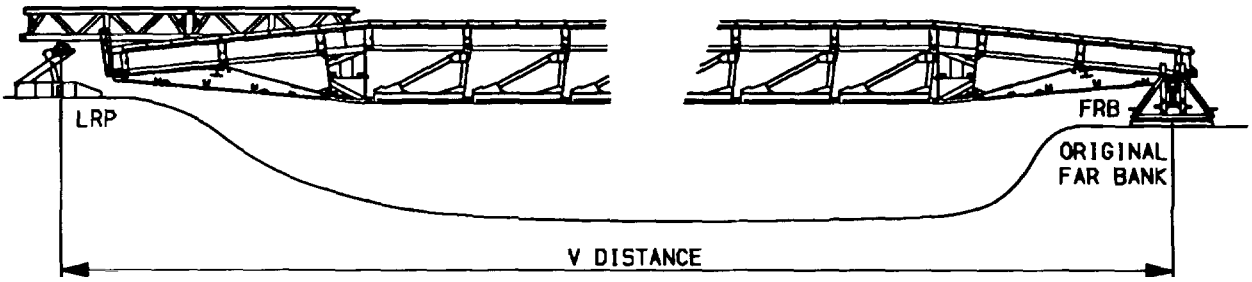
(d) Raise landing roller pedestal until bridge is just clear of ground (approx. 11/2 in).

(e) Using vehicle and push bar, slide the bridge over timbers and landing roller pedestal until 4.5 ft (1.4 m) is over near bank.

(f) Lower landing roller pedestal and reposition until base of landing roller pedestal is within 9 in (23 cm) of bankseat beam.

CAUTION
Exceeding the V distance could cause damage to components.

(3) Raise near bank end of bridge and position forward roller beam under bridge. Ensure V-distance is not exceeded.



(Not to be greater than distance tabulated, eg. See TM 5-5420-212-10-2)

(4) Assemble and position rear roller beam.

(5) Complete assembly of launching nose.

(6) Connect vehicle and push bar to near bankseat beam.

(7) Using landing roller pedestal, raise bridge off ground until jack is fully extended.

NOTE
Vehicle is holding bridge and rollers are locked.

(8) Delaunch bridge and position rear roller beam under the rear of the bridge. Position RRB using longitudinal girders, then disconnect girders from RRB and place on the ground.

(9) Level both roller beams.

(10) Continue delaunch to panel point 5p6 (over front roller beam).

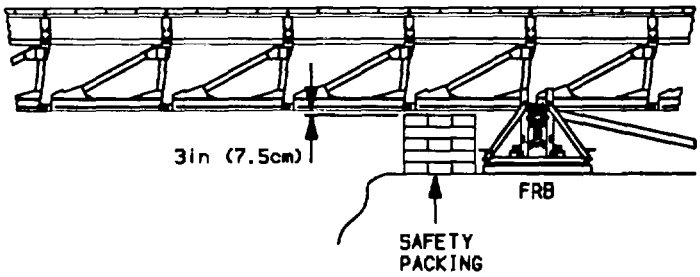
CAUTION
The center of gravity of the bridge is over the front roller beam. It is at this point that any minor adjustments in the rear roller beam placement must be made. Ensure that the bridge will come to rest on the roller beams correctly. The bridge should rest between the flanges of the rollers, not on top of them.

(11) Recover landing roller pedestal.

(12) Continue delaunch to panel point 6pl (over rear roller beam).

WARNING
Safety packing under the bridge in front of the front roller beam is used as a safety stop to prevent loss of the bridge during the removal of bridge bays. Safety packing will be put in after step (12) and will remain in place until the last boom is made.

(13) Place safety packing in front of front roller beam. Stack packing between front roller beam and the edge of gap and keep height of packing within 3 in (7.5 cm) of bottom of bridge girder. If minimum bearing has been used, place packing inside FRB baseplates under the bridge girder.



(14) Remove end of bridge.

(15) Remove junction panel (para. 4-27a.).

CAUTION

For all booms/delaunches with the vehicle, before connecting the push bar cross girder and push bar, ensure the last bottom panel top jaws are still located round the panel pin.

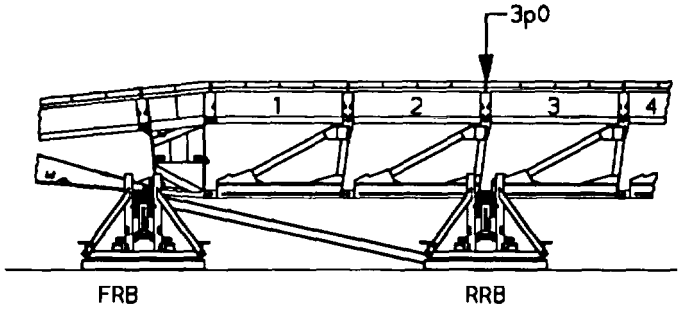
(16) Boom bridge to 4p6 (over rear roller beam).

(17) Remove deck unit in bay 11 then remove bay 12, bay 11 and bottom panel of bay 10 (para. 4-27b and c.).

(18) Boom bridge to panel point 3p6 (over rear roller beam).

(19) Remove top panel 10, bay 9 and bottom panel 8.

(20) Boom bridge to panel point 3p0 (over rear roller beam).

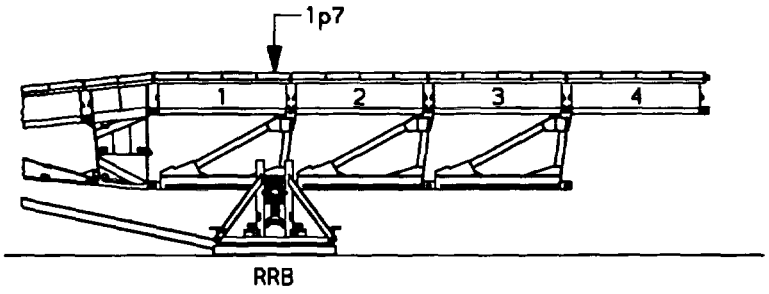


(21) Remove deck unit in bay 7, then top panel 8, bottom panel 7, top panel 7 and bottom panel 6.

NOTE

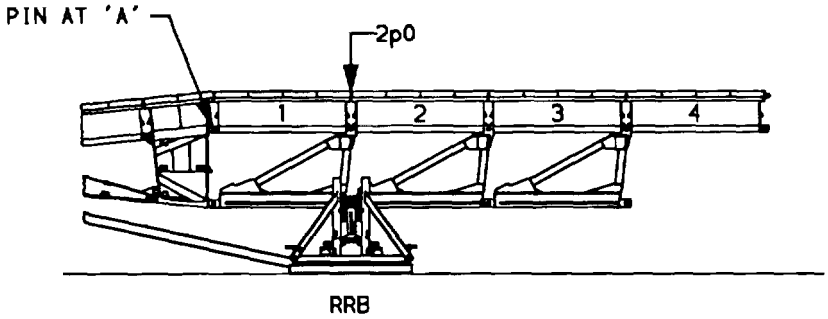
Additional booms to panel point 1p7 and 2p0 are required to ease the removal of the last four bottom panels and the pin in the last top panel and junction panel.

(22) Boom bridge to 1 p7 over rear roller beam. Disassemble the bridge until the top panel in bay 4 is reached. DO NOT REMOVE BAY 4 TOP PANEL.



(23) Remove the launching nose.

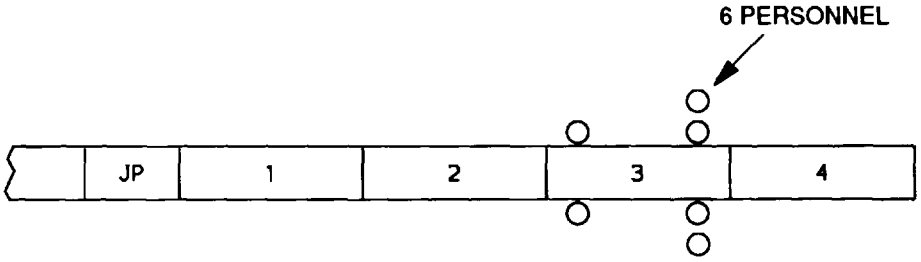
(24) Boom bridge to panel point 2p0 (over rear roller beam). This boom is needed to make the removal of the pin at "A" easier.



NOTE

The panel pin In the upper pin jaws of the junction panel and last top panel is called the pin at "A." This panel pin must be removed before the top panel of Bay 4 can be removed. The removal of the pin at "A" serves the same purpose as unlocking the bottom panel shoot bolt.

(25) To remove the pin at “A” position six personnel around the rearmost bottom panel, and lift, then remove pin.



(26) Boom bridge to panel point lp4 (over rear roller beam).

(27) Remove remaining bays of bridge until bottom panel 2 is removed. Remove deck unit in bay 1.

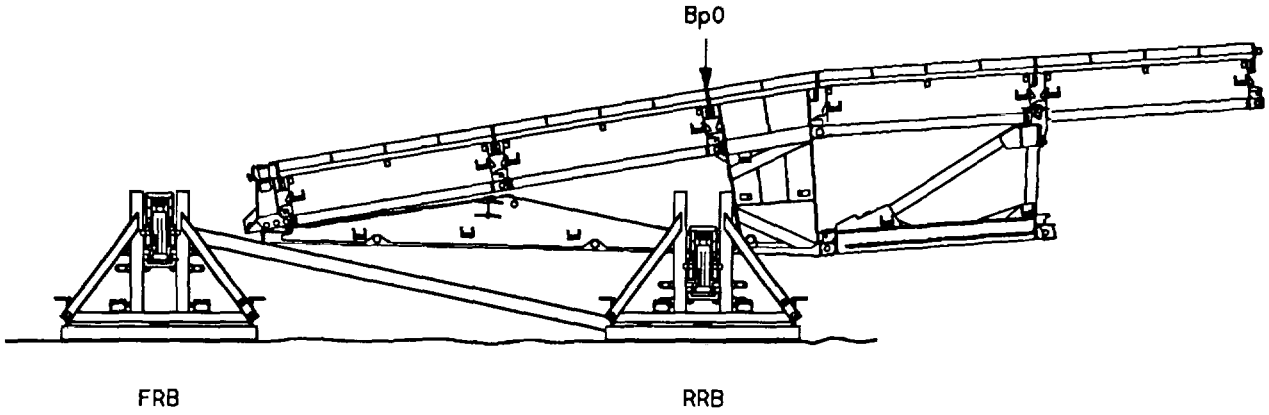
(28) Position 16 personnel (right and left side crews) around end of bridge.

(29) Unlock roller beam rollers.

CAUTION

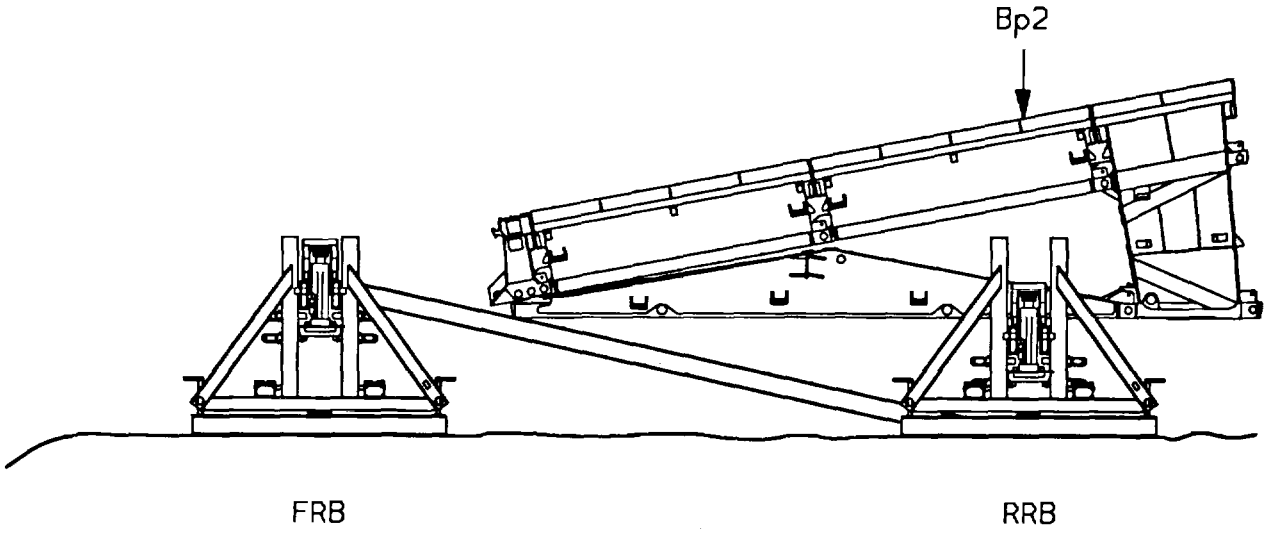
It is necessary to lift the end of bridge off the front roller beam rollers and back onto the longitudinal girders. Do not allow bridge to drop onto longitudinal girders.

(30) All 16 personnel lift bridge back to Bp0 (over RRB).



(31) Remove top panel 2 and bay 1.

(32) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(33) Lock rollers. Disassemble end of bridge.

(34) Disassemble roller beams.

(35) Clear site.

6-4. ASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT

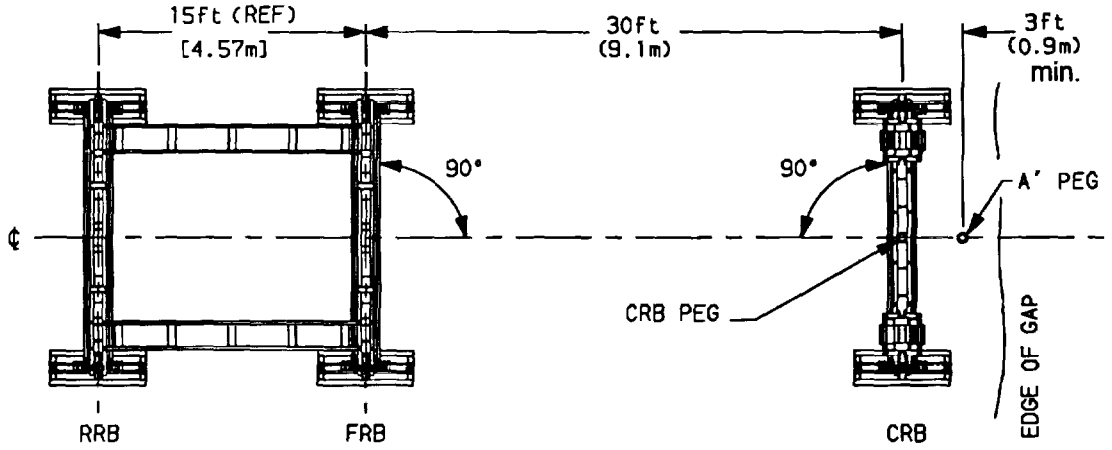
a. Set up and align roller beams

(1) Assemble capsill roller beam (CRB) front roller beam (FRB) and rear roller beam (RRB) and position on site as shown (para. 4-5c.).

(2) Ensure roller beams are level.

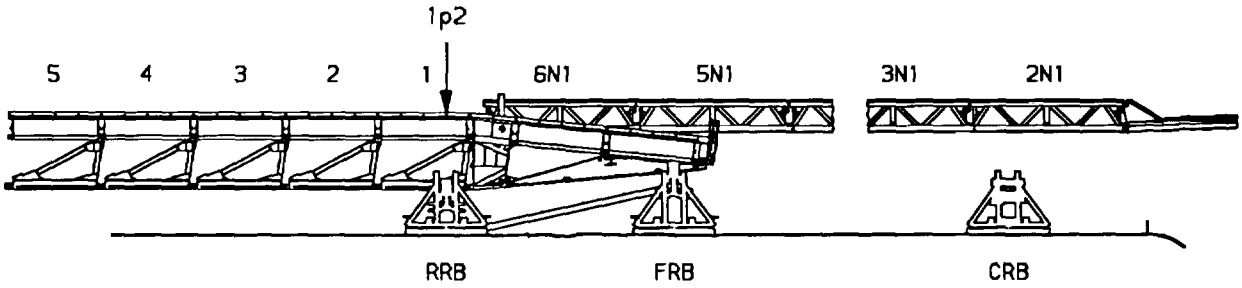
CAUTION

It is very Important that roller beams be correctly positioned at this time. If they are not, serious problems will arise during construction due to the bridge deviating from the centerline.



b. Assembly

(1) Perform steps b. (1) thru (9) in paragraph 61 to assemble end of bridge, bays 1 thru 5 and launching nose up to 6N1, with LRP secured on launching nose.



(2) Add three double story nose sections (1N2, 2N2, 3N2), booming the nose forward and securing with a panel pin in nose roller as each double story nose is added (para. 4-12c.). Ensure that launching nose link is vertical.

(3) Add bay 6 including sway brace.

CAUTION

The following cautions should be observed each time the bridge is boomed. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

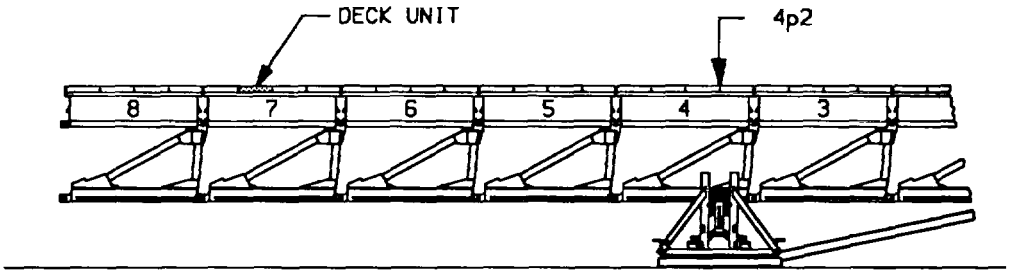
NOTE

Throughout the build the bridge is boomed using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(4) Connect push bar. Unlock rollers. Boom bridge to panel point 2p4 (over RRB). Lock rollers and disconnect push bar.

(5) Add bays 7, 8 and 9 including sway braces. Add deck unit in third recess of bay 7.

(6) Connect push bar. Unlock rollers. Boom bridge to panel point 4p2 (over RRB). Lock rollers and disconnect push bar.



(7) Add bays 10, 11, 12 and 13, including sway braces. Place one deck unit in the third recess of bay 11 to keep the bridge girders correctly spaced.

(8) Connect push bar. Unlock rollers. Boom bridge to panel point 1p0 (over RRB). During this boom the front bankseat beam will approach capsill roller beam. Boom bridge as follows:

(a) Boom bridge until bankseat beam is within 1 ft (0.3 m) of capsill roller beam. Stop boom but do not lock rollers. Vehicle is holding bridge.

(b) Adjust height of capsill roller beam to slightly below leading edge of taper panel. Do not remove support pins.

(c) Unlock rollers in capsill roller beam.

(d) Continue to boom slowly, watching end of bridge as it passes over capsill roller beam.

(e) Ensure capsill roller beam is level under bridge and square with end of bridge. Align capsill roller beam under exact same point on both sides of bridge.

CAUTION

When raising capsill roller beam never position jack seat higher than 3rd pin hole. Placing jack seat higher than 3rd pin hole could result in roller beam lifting out of adjustable supports.

(f) Raise capsill roller beam until there is full bridge contact.

(g) Lower front roller beam to clear bottom of bridge. Do not remove jacks.

(h) Stop boom at 1p0 (over RRB). Lock rollers and disconnect push bar.

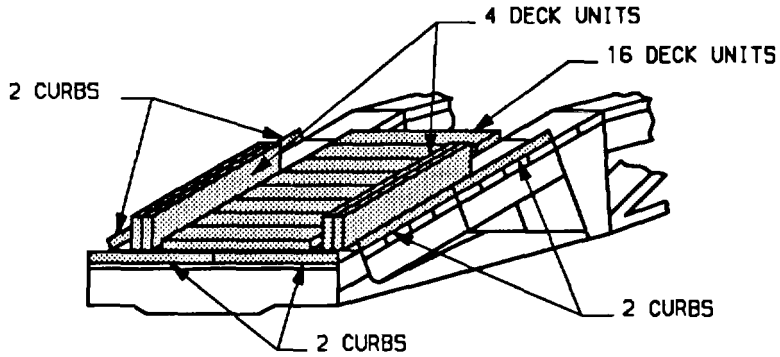
(i) Raise or lower rear roller beam as needed to bring rear of bridge to a height that will make assembly of next bays as easy as possible and level capsill and rear roller beams.

(9) Add bays 14 thru 22 including sway braces.

(10) Place one deck unit in the third recess of bays 17 and 21.

(11) Complete end of bridge (para. 4-9b.).

(12) Add twenty deck units and six curbs as counterweight. Position a flat bed vehicle close to the end of bridge and use personnel standing on vehicle to transfer the counterweight from ground level up to personnel on the end of bridge.



NOTE

The launch of the bridge is done with a vehicle and long push bar connected to the bankseat beam (para. 4-18c.). Once this vehicle Is connected to bridge it will not be disconnected until far bank end of bridge has been lowered to ground.

(13) Connect vehicle and push bar to bridge (para. 4-1&c).

(14) Unlock rollers. Launch bridge to panel point 10p7 (over CRB). This puts the CG over CRB.

(15) Do not lock rollers; the vehicle is used to hold the bridge in place.

(16) Set up landing roller pedestal Mk1 (para. 4-15a.) on far bank and check that LZ6 or higher is over the center of LRP rollers (para. 4-4).

CAUTION

A landing zone number higher than the given LZ is always permitted. Never use an LZ number lower than that given for the bridge being constructed.

(17) Continue launch until panel point 19p5 is over capsill roller beam.

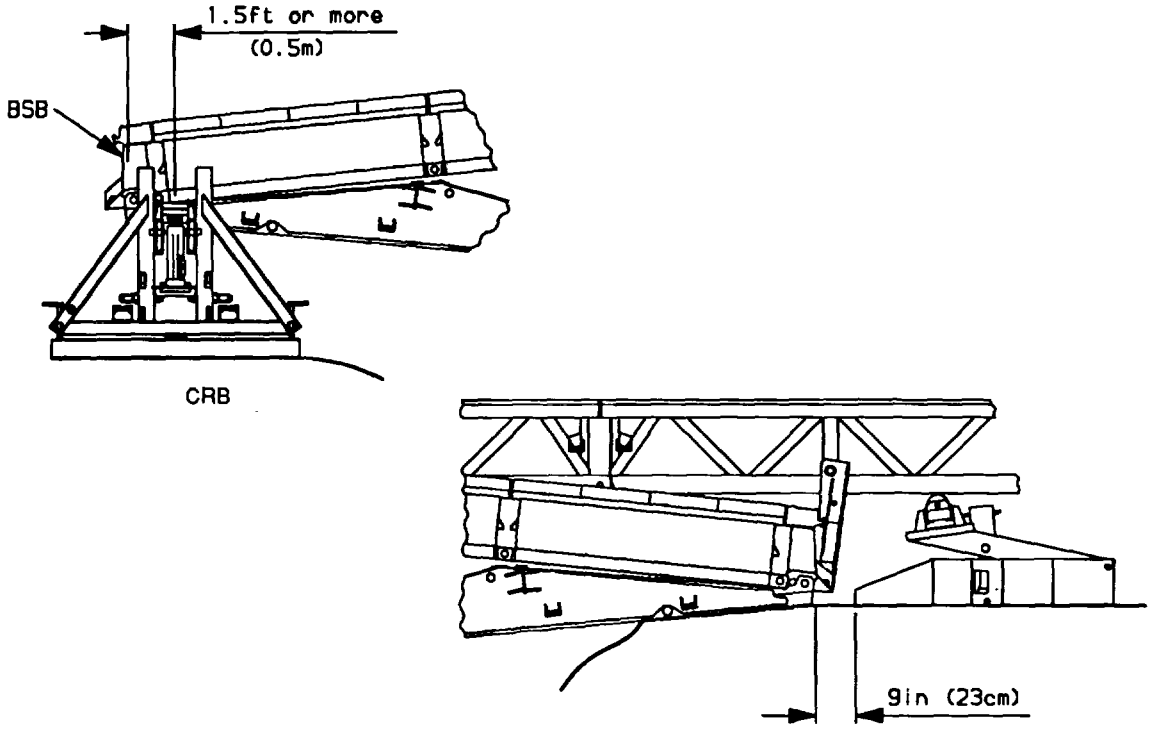
NOTE

Nose sections (light and heavy) can be removed during launch after they have passed the center of the landing roller. It is important to remember that at least 5 ft (1.5 m) of nose section must extend beyond the landing at all times.

(18) Remove nose sections that have passed the landing roller pedestal. Leave the three nose sections in place. These sections will be removed after the far bank end of bridge has been lowered to the ground.

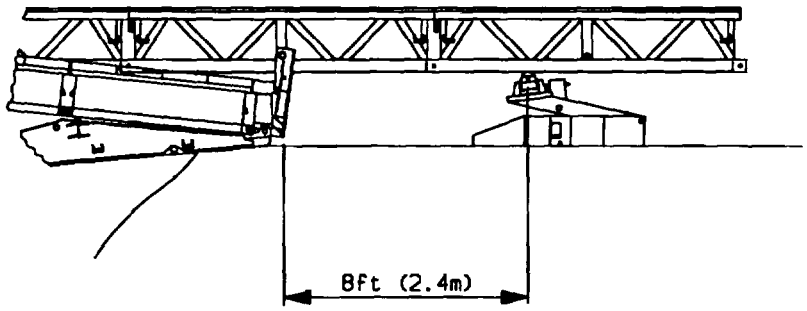
(19) Disassemble rear roller beam and front roller beam. Do not allow personnel to work under bridge.

(20) Continue launch until the far bank bankseat beam is within 9 in (23 cm) of landing roller pedestal base. The near bank end of bridge should be1.5 ft (0.5 m) or greater from center of the capsill roller beam rollers.



(21) Lock capsill roller beam rollers.

(22) Lower far bank end of bridge by operating jack in landing roller pedestal. Reposition landing roller pedestal so the center of roller is 8 ft (2.4 m) from nose roller on bankseat beam. Raise landing roller pedestal until roller touches bottom of launching nose.



(23) Disconnect vehicle and push bar from bridge.

(24) Remove remaining launching nose heavy sections (para. 4-13c) and launching nose roller (reverse of para. 4-10).

(25) Remove launching nose cross girder and nose cross girder posts (para. 4-11).

(26) Distribute deck units and curbs from counterweight to their final positions and remove curbs from bankseat beam to enable jacking brackets to be fitted if davits are to be used.

(27) Lower near bank end of bridge using jacks (para. 4-20), davits (para. 4-21) or crane (para. 4-22).

(28) If approach surface is to be improved, do so at this time.

(29) Hook seven long ramp units to near bankseat beam. Ensure anti lift-lugs are engaged (para. 4-24).

(30) Lay decking, starting on near bank end of bridge (para. 4-25).

(31) If exit surface is to be improved, do so at this time.

(32) Hook seven long ramp units to far bankseat beam. Ensure anti lift-lugs are engaged.

(33) Fit curbs, starting on near bank end of bridge (para. 4-26).

(34)Put bridge guide markers in place (para. 4-26).

(35) After bridge has passed inspection, put bridge classification signs in place.

(36) Make sure all erection equipment is away from roadway. The bridge is now ready for use.

6-5. DISASSEMBLY 2E + 22 BAY - W/O LINK REINFORCEMENT

a. Preparation for Disassembly

(1) If pumps, hoses and water are available, the bridge and erection components should be washed before loading them on pallets.

(2) If washing cannot be done, the components are loaded directly onto the proper pallet.

b. Disassembly

NOTE

Throughout bridge disassembly the NCOIC must monitor the height and level of roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Remove bridge classification signs, bridge guide markers and curbs (reverse of para. 4-26). Retain six curbs on the near bank end of bridge as part of counterweight [see step (3)].

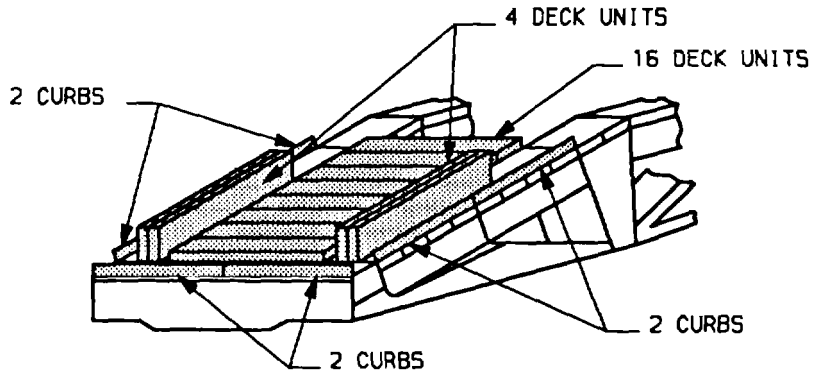
(2) Remove far bank ramp units, removing center ramp first (reverse of para. 4-24).

(3) Remove deck units (reverse of para. 4-25), starting on the far bank end of bridge as follows:

(a) Leave a deck unit in the third recess of bay 1,7, 11, 17 and 21.

(b) Leave both bays of near end of bridge fully decked (eight deck units).

(c) Transfer remaining twelve deck units (this makes a total of twenty) and six curbs to complete the counterweight on near bank end of bridge.



(4) Add launching nose cross girder posts (para. 4-11b), then install launching nose cross girder onto posts at required height (para. 4-11c).

(5) Remove near bank ramp units, removing center ramp first (reverse of para. 4-24).

(6) Raise near bank end of bridge using jacks, davits or crane, high enough to install capsill roller beam (CRB).

(7) Assemble capsill roller beam, and slide under rear of bridge. Center capsill roller beam under bridge at least 1.5 ft (0.5 m) from end of end taper panel.

(a) Ensure capsill roller beam is over centerline of bridge. Center of capsill roller beam must be directly over capsill roller beam peg.

(b) Ensure capsill roller beam is at right angle (900) to centerline of bridge.

(c) Lock rollers.

(8) Operate jacks in capsill roller beam until weight of bridge is on capsill roller beam and off packing.

(9) Remove packing.

(10) Position capsill beam at required height for delaunch. Use carpenter's level to level roller beam.

(11) Move vehicle into position about 15ft (4.6m) from end of bridge. Ensure vehicle is in line with bridge and centered over centerline.

(12) Connect vehicle to bridge with long push bar (para. 4-18c.).

NOTE

The bridge will be held in position by the vehicle and locked rollers of roller beam during assembly of launching nose.

(13) Connect launching nose roller to far bank bankseat beam (para. 4-10).

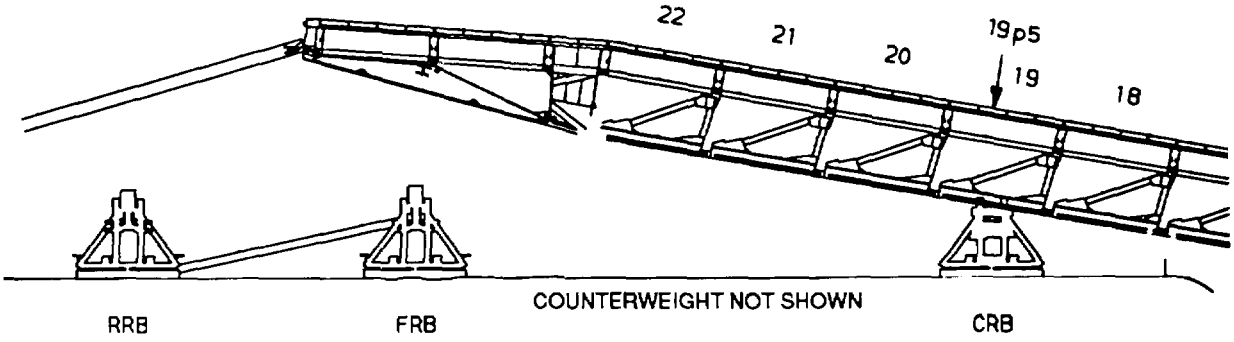
(14) Assemble launching nose (para. 4-14a.).

(15) Using landing roller pedestal, raise far bank end of bridge until jack is fully extended.

(16) Unlock rollers. Delaunch bridge until panel point 19p5 is over center of capsill roller beam. Do not disconnect push bar.

(17) Assemble and position front roller beam (FRB) 30 ft (9.1 m) from capsill roller beam and rear roller beam 15 ft (4.6 m) from front roller beam. Ensure centers of roller beams are over centerline of bridge and roller beams are at 900 to centerline. Position RRB using longitudinal girders, then disconnect girders from RRB and place on the ground.

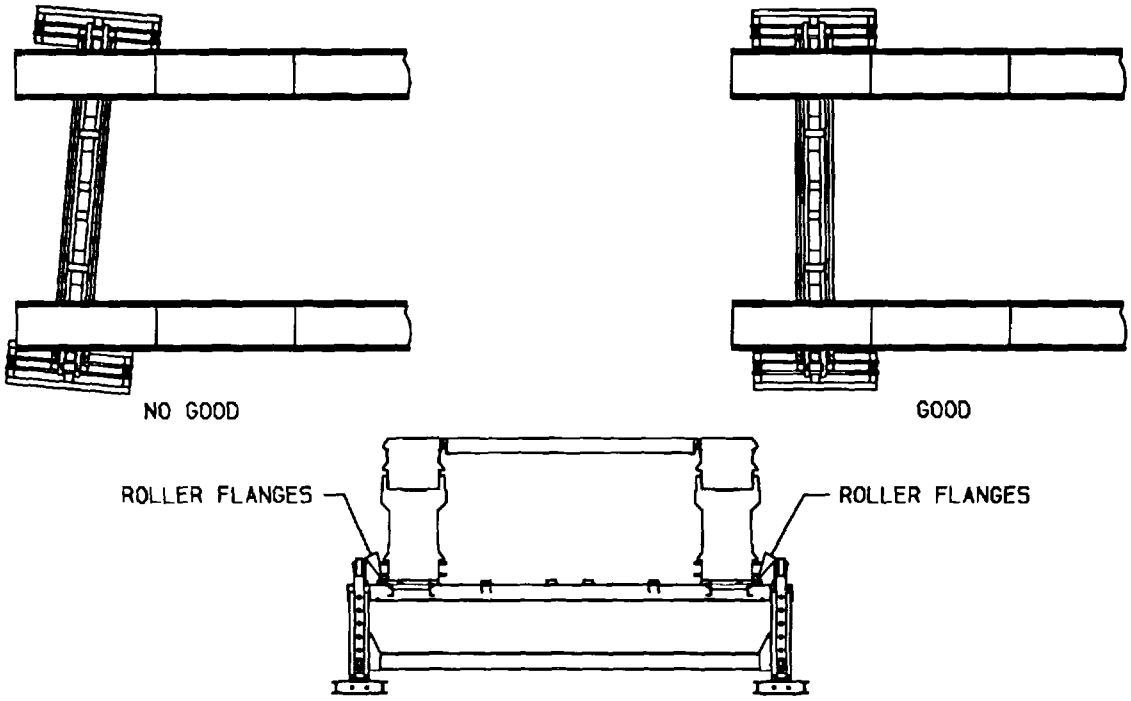
(18) Level roller beams.



(19) Delaunch bridge to panel point 10p7 (over CRB).

NOTE

The center of gravity of bridge is over the capsill roller beam. It is at this point that any minor adjustments in the front and rear roller beam placement must be made. Ensure that bridge will come to rest on rear roller beam correctly. The bridge should rest between flanges of rollers, not on top of them. The roller beams must be at 90° to the bridge centerline.



(20) Hold rear of bridge down on roller beams.

(21) Lower jack in landing roller pedestal. Remove landing roller pedestal from under launching nose and remove jack.

(22) Recover landing roller pedestal (para. 4-15c.).

(23) Boom to 11pO over rear roller beam. Lock rollers, and disconnect push bar (para. 4-18e.).

(24) Position a flat bed vehicle close to the end of bridge and use personnel standing on this to transfer the twenty deck and six curb counterweight from the bridge to the personnel at ground level.

(25) Level both roller beams using carpenter's level.

(26) Remove sway braces from end of bridge.

(27) Disassemble end of bridge (reverse of para. 4-9b).

(28) Remove bays 22 through 14.

CAUTION

The following cautions must be observed each time the bridge is delaunched. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

NOTE

The bridge is delaunched/boomed using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are removed. To simplify the following procedures, these drills are described "connect push bar" and "disconnect push bar."

(29) Connect push bar. Unlock rollers and boom the bridge as described below to panel point 4p2 over rear roller beam. During this boom the end of bridge will leave CRB.

(a) Boom bridge until bankseat beam is lift (0.3 m) gap side of capsill roller beam. Stop boom but do not lock rollers, vehicle is holding bridge.

(b) Raise FRB into contact with the bridge and at the same time lower the CRB so that the weight of the bridge is gradually transferred from the CRB to the FRB. Careful transfer of weight from CRB to FRB should achieve the correct working height at the end of bridge.

(c) Continue boom to 4p2 (over RRB). Lock rollers and disconnect push bar.

(d) If proper working height was not achieved at (b), adjust FRB and RRB to accommodate easy disassembly. Level roller beams.

(30) Remove deck unit in bay 11 and remove bays 13 through 10.

(31) Connect push bar. Unlock rollers and boom to panel point 2p4 (over RRB). Lock rollers and disconnect push bar.

(32) Remove deck unit in bay 7 and remove bays 9 through 7.

(33) Connect push bar. Unlock rollers and boom to panel point 1 p2 (over RRB). Lock rollers and disconnect push bar.

(34) Remove bay 6.

(35) Remove double story nose 3N2, 2N2 & 1N2.

(36) Remove bays 5 and 4, and heavy launching noses 6N1, 5N1, 3N1 and 2N1.

(37) Remove landing roller pedestal from launching nose.

(38) Move launching nose until rear of light launching nose rear is over launching nose cross girder and remove last launching nose heavy.

(39) Remove light launching nose.

(40) Remove nose roller from bankseat beam (reverse of para. 4-10.

(41) Remove launching nose cross girder and posts (para. 4-11).

(42) Remove bays 3 and 2.

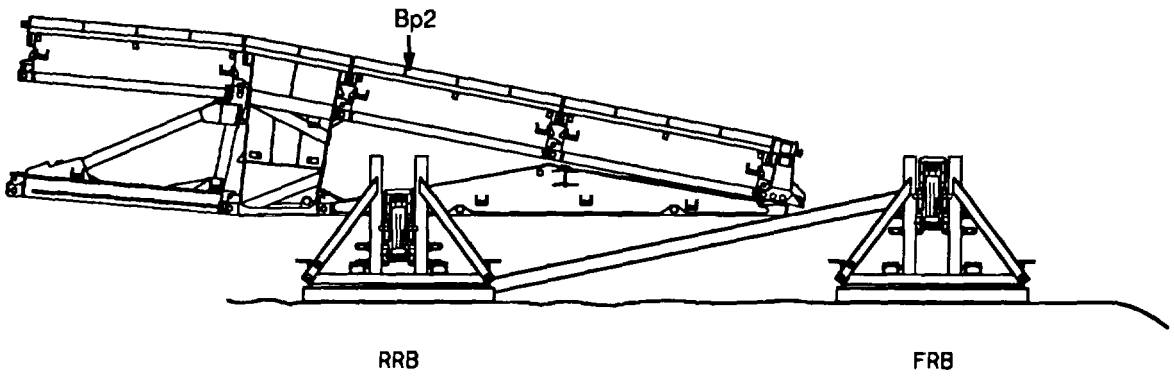
(43) Position 16 personnel (right and left side crews) around end of bridge.

(44) Unlock roller beam rollers.

CAUTION

It is necessary to lift the end of bridge of the front roller beam rollers and back onto longitudinal girder. Do not allow bridge to drop onto longitudinal girder.

(45) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(46) Lock rollers. Disassemble bay 1 and end of bridge (reverse of para. 4-8).

(47) Disassemble roller beams.

(48) Clear site.

Section III. RESTRICTED SITES

This section describes the procedures for assembly and disassembly of 2E + 12 bay double story bridges on restricted sites. A site is considered restricted when the R distance (construction space) is less than the distance given in Table 3-8, 3-15, 3-24 and 3-32.

This R distance can be reduced by as much as 3 bays by using launching noses one or two sections longer than the standard launching nose and by booming the bridge more frequently. Table 6-29 gives the minimum R distance possible when using launching nose longer than standard. The R distances do not include length of push bar or vehicle.

TABLE 6-23. Minimum R Distance when using longer than standard launching noses

2E + No. of Bays	NOSE CONSTRUCTION					
	3N1	4N1	5N1	6N1	7N1	8N1
1	30 ft 9.1 m					
2		30 ft 9.1 m				
3		30 ft 9.1 m				
4		30 ft 9.1m	22 ft 6.7 m			
5			30 ft 9.1 m	24 ft 7.3 m		
6			36 ft 11.0	30 ft 9.1 m		
7			42 ft 12.8 m	36 ft 11.0 m		
8				42 ft 12.8 m	36 ft 11.0 m	
9				48 ft 14.6 m	42 ft 12.8 m	
10				54 ft 16.5 m	42 ft 12.8 m	
11					54 ft 16.5 m	42 ft 12.8 m
12					54 ft 16.5 m	48 ft 14.6 m

R Distances above do not include length of push bar or launching vehicle.

Since the procedures are very similar to bridges on normal sites, only the steps that are different will be detailed. The operator should be familiar with the General Drills (Chapter 4) and the assembly and disassembly of double story bridges on normal sites before attempting a restricted site build.

6-6. ASSEMBLY - DOUBLE STORY 2E + 12 BAY (Restricted Site)

a. General

Assembly on a restricted site is made possible by using a longer than normal launching nose. Since the assembly procedures are similar to a 2E + 12 bay bridge on a normal site (para. 6-1) only the steps that are different are given in detail.

b. Assembly

(1) Perform steps a. (1) and (2) and b. (1) thru (8) in paragraph 6-1.

(2) Add seventh heavy nose section (7N1).

(3) Lift gravity catch, remove carrying bar and push nose forward until anchorage tube in sixth nose section is aligned with nose roller.

(a) Insert panel pin through anchorage holes and tube.

(b) Put retainer clip through end of panel pin.

(4) Add bay 4, including sway brace.

(5) Add eighth heavy nose section (8N1), boom nose forward and secure with panel pin as described in step (3).

CAUTION

The following cautions should be observed each time the bridge is boomed. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

NOTE

Throughout the build the bridge is boomed using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(6) Connect push bar. Unlock rollers and boom bridge to 1p6 (over RRB). Lock rollers, and disconnect push bar.

(7) Add bay 5, including sway brace.

(8) Connect push bar. Unlock rollers and boom bridge to 2p3 (over RRB). Lock rollers, and disconnect push bar.

(9) Add bay 6, including sway brace.

(10) Connect push bar. Unlock rollers and boom bridge to 3p0 (over RRB). Lock rollers, and disconnect push bar.

(11) Add bay 7, including sway brace.

(12) Connect push bar. Unlock rollers and boom bridge to 3p4 (over RRB). Lock rollers, and disconnect push bar.

(13) Add bay 8, including sway brace.

(14) Connect push bar. Unlock rollers and launch bridge to lp6 (over RRB). Lock rollers.

(15) Set up landing roller pedestal (LRP) on far bank. With 1p6 over forward roller beam, check to ensure that landing zone (LZ) number 1 or higher is over center of landing roller pedestal.

CAUTION

A landing zone number higher Is permitted. Never use an LZ number lower than that given.

(16) Unlock rollers and boom to 6p4 (over FRB). Lock rollers.

(17) Disassemble rear roller beam.

(18) Unlock rollers and boom to 8p4 over FRB (pp 4 of last bay). Lock rollers, and disconnect push bar.

(19) Add bay 9 including sway brace.

(20) Remove nose sections that have passed landing roller pedestal. Leave the last three nose sections in place. These will be removed after far bank end of bridge has been lowered to the ground.

(21) Connect push bar. Unlock rollers and boom to 9p4 (pp 4 of last bay). Lock rollers, and disconnect push bar.

(22) Continue this process, adding a bay and booming to pp 4 of that bay, until bay 12 is added and bridge is boomed to 12p4 (over FRB).

(23) Complete end of bridge (para. 4-9b.). Use stacked deck units as a working platform.

(24) Follow steps (29) thru (42) in paragraph 61 to complete bridge.

6-7. DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Near Bank)

a. General

Disassembly on a restricted site is made possible by using a longer than normal launching nose. Since the disassembly procedures are similar to a 2E + 12 bay bridge on a normal site (para. 62) only the steps that are different are given in detail.

b. Disassembly

(1) Perform steps a. (1) thru (2) and b. (1) thru (21) in paragraph 62.

CAUTION

The following cautions should be observed each time the bridge is delaunched. Do not allow vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

NOTE

Throughout the build the bridge is boomed using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(2) Connect push bar. Unlock rollers and delaunch to 12p4 (over FRB). Lock rollers, and disconnect push bar.

(3) Disassemble end of bridge.

(4) Connect push bar. Unlock rollers and delaunch to 11 p4 (over FR B). Lock rollers, and disconnect push bar.

(5) Remove bay 12.

(6) Connect push bar. Unlock rollers and delaunch to 10p4 (over FRB). Lock rollers, and disconnect push bar

(7) Continue this process, removing a bay and delaunching to pp 4 of the last bay, until the bridge is delaunched to 8p4 and bay 9 has been removed.

(8) Connect push bar. Unlock rollers and delaunch to 2p6 (over FRB), and disconnect push bar.

(9) Assemble and position rear roller beam over centerline 15 ft (4.6 m) from front roller beam. Position roller beam using longitudinal girders, then disconnect girder from RRB and place on the ground.

(10) Set roller beams at correct height. During this process, level roller beams with carpenter's level.

(11) Connect push bar. Unlock rollers and delaunch to 1 p6 (over FRB). Do not disconnect vehicle from bridge.

NOTE

Center of gravity of bridge is over front roller beam. It is at this point that any minor adjustments in the rear roller beam placing must be made. Ensure that the bridge will come to rest between the flanges of the rollers, not on top of them. Ensure rear roller beam Is at 90° to bridge centerline.

(12) Recover landing roller pedestal.

(13) Boom to 3p4 (over RRB). Lock rollers, and disconnect push bar.

(14) Remove bay 8.

(15) Connect push bar. Unlock rollers and boom to 3p0 (over RRB). Lock rollers, and disconnect push bar.

(16) Remove bay 7.

(17) Connect push bar. Unlock rollers and boom to 2p3 (over RRB). Lock rollers, and disconnect push bar.

(18) Remove bay 6.

(19) Connect push bar. Unlock rollers and boom to 1p6 (over RRB). Lock rollers, and disconnect push bar.

(20) Remove bay 5.

(21) Connect push bar. Unlock rollers and boom to lp2 (over RRB). Lock rollers, and disconnect push bar.

(22) To remove eighth nose section (8N1):

(a) With center crew prepared to move launching nose to rear of site, remove retainer clip and panel pin from nose roller.

(b) Move launching nose to rear until next anchorage tube is slightly behind nose roller (6N1).

(c) Put panel pin through nose roller and anchorage tube.

(d) Remove 8N1.

(23) Remove bay 4.

(24) Use same method step (22) to remove 7N1, 6N1, 5N1, 4N1 and 3N1.

(25) Follow steps (40) to (53) in paragraph 6-2 to complete disassembly of bridge.

6-8. DISASSEMBLY - DOUBLE STORY - 2E + 12 BAY (Restricted Site - Original Far Bank)

a. General

This paragraph provides only the additional or modified steps needed to disassemble the 2E + 12 bay MGB on the original far bank, on a restricted site. The operator must be familiar with, or refer to, the General Drills (Chapter 4) and Disassembly Double Story 2E + 12 bay - Normal Site - Original Far Bank (para. 6-3).

NOTE

The original far bank becomes the new near bank, and the original near bank becomes the new far bank. Also the bays of the bridge must be renumbered from the new far bank. Using a 2E + 12 Bay as an example, what was bay 12 is now bay 1, and what was bay 1 is now bay 12.

All reference to near or far bank from this point will be referring to the new near bank and the new far bank. Move all launching nose components to the far bank, and all the roller beam components to near bank. All pallets must be moved to near bank.

b. Disassembly

(1) Perform steps b. (1) thru (3) and (5) thru (6) in paragraph 6-3. The rear roller beam is assembled and positioned later at step (14).

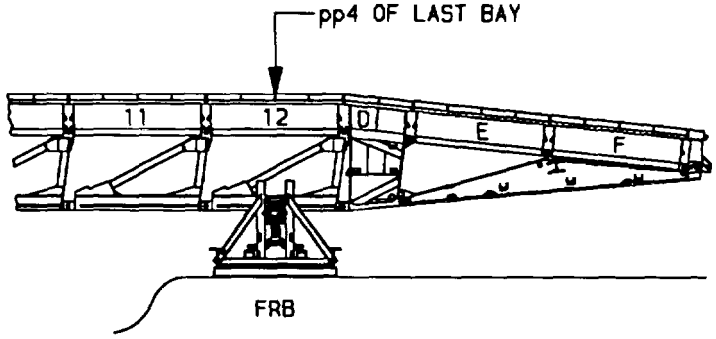
(2) Using landing roller pedestal, raise bridge off ground until jack is fully extended.

NOTE

Vehicle is holding bridge and roller catches in front roller beam are locked.

(3) Delaunch bridge to panel point 4 of the last bay of bridge 1 2p4 (over front roller beam).

(4) Disconnect vehicle from bridge.



(5) Disassemble the end of bridge (except for the junction panel).

(6) Delaunch bridge to 11p4 (over front roller beam).

(7) Remove junction panel (para. 4-27a.) and bay 12 bottom panel (para. 4-27c.).

CAUTION

To enable the push bar cross girder to be connected safely, reconnect the last bottom panel to the last top panel. This must be done before every de-launch or boom.

(8) Delaunch to 8p7

(9) Remove bay 12 top panel and bay 11 bottom panel (para. 4-27b. and c.).

(10) Delaunch to 7p7 (over FRB).

(11) Remove bay 11 top panel and bay 10 bottom panel.

(12) Delaunch to 6p7 (over FRB).

(13) Remove bay 10 top panel and bay 9 bottom panel.

(14) Assemble and position rear roller beam (RRB). Position the RRB using longitudinal girders, then disconnect girders from RRB and place on the ground.

(15) Position the roller beam at the height desired for delaunch. During this positioning, level both roller beams using a carpenter's level.

(16) Delaunch to 2p0 (over FRB).

NOTE

The center of gravity of the bridge is over the front roller beam. It is at this point that any minor adjustments in the rear roller beam placement must be made. Ensure that the bridge will come to rest on the roller beams correctly. The bridge should rest between the flanges of the rollers, not on top of them.

(17) Recover landing roller pedestal.

(18) Boom bridge to 3p4 (over RRB).

(19) Remove bay 9 top panel and bay 8 bottom panel.

(20) Boom bridge to 3p0 (over RRB).

(21) Remove bay 8 top panel and bay 7 bottom panel.

(22) Boom bridge to 2p3.

(23) Remove bay 7 top panel and bay 6 bottom panel.

(24) Boom bridge to 1p7.

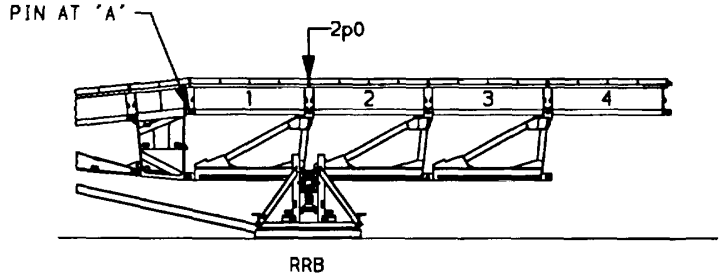
(25) Remove bay 6 top panel, bay 5 bottom panel, one LNH (8N1), bay 5 top panel and bay 4 bottom panel. Do not remove bay 4 top panel.

(26) Remove remainder of launching nose.

NOTE

Additional boom to panel points 1 p7 and 2p0 are required to ease the removal of the last four bottom panels and the pin in the last top panel and junction.

(27) Boom bridge to 2p0 (over RRB).

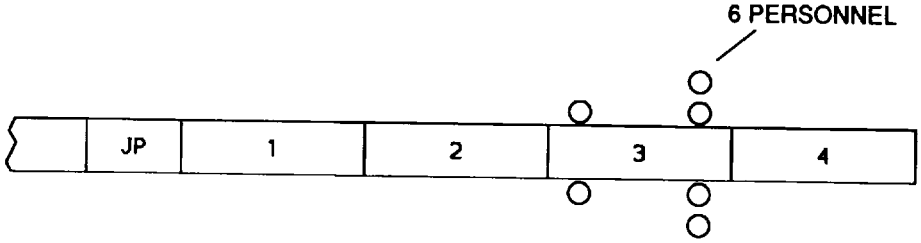


NOTE

The panel pin in the upper pin jaws of the junction panel and last top panel Is called the pin at "A." This panel pin must be removed before the top panel of bay 4 can be removed. The removal of the pin at "A" serves the same purpose as unlocking the bottom panel shoot bolt.

(28) To remove the pin at "A."

(a) Position six personnel around the rearmost bottom panel.



(b) Remove the pin at "A" as the six personnel lift the bottom panel.

(29) Boom bridge to panel point 1p4.

(30) Remove remaining bays of bridge until bay 2 bottom panel is removed.

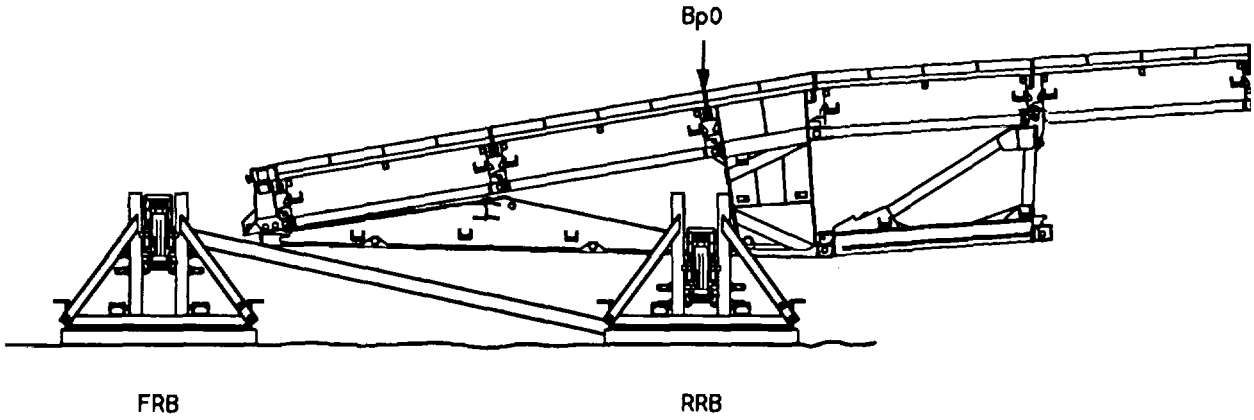
(31) Position 16 personnel (right and left side crews) around end of bridge.

(32) Unlock roller beam rollers.

CAUTION

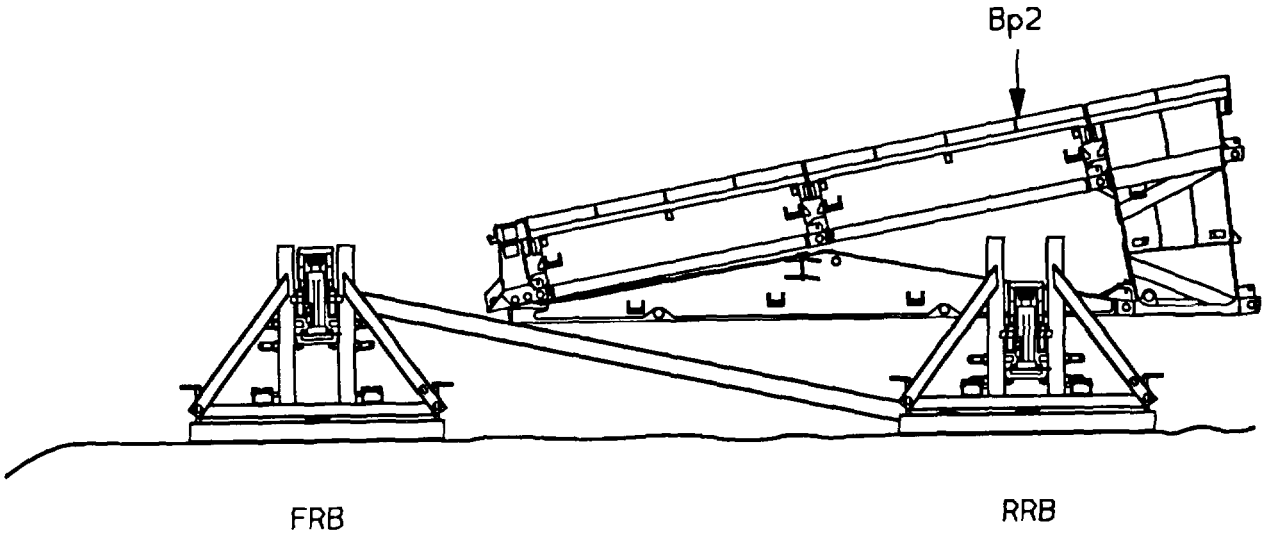
It is necessary to lift the end of bridge off the front roller beam rollers and onto the longitudinal girders. Do not allow bridge to drop onto longitudinal girders.

(33) All 16 personnel lift bridge back to Bp0 (over RRB)



(34) Remove top panel 2 and bay 1.

(35) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(36) Lock rollers. Disassemble end of bridge.

(37) Disassemble roller beams and clear site.

Section IV. COUNTERWEIGHTS - DOUBLE STORY

It is necessary to use counterweights during assembly/delaunch of double story bridges over 12 bays long without link reinforcement. On normal sites 19 thru 22 bay bridges use counterweights. On restricted sites 13 thru 22 bay bridges use counterweights. The following paragraphs describe the counterweights, but do not describe when they are added or removed. This depends on the size of bridge and type of site.

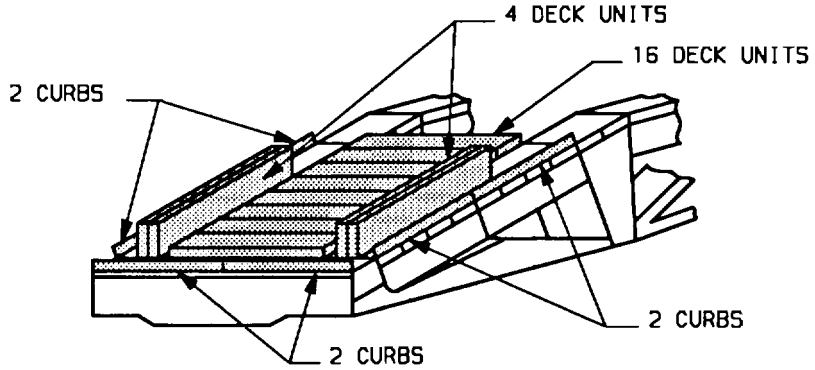
NOTE

It is important to always refer to the build and boom or delaunch table for the bridge being built or delaunched, to determine when the counterweights are added or removed.

6-9. 2E + 19 thru 2E + 22 w/o LRS - NORMAL SITE

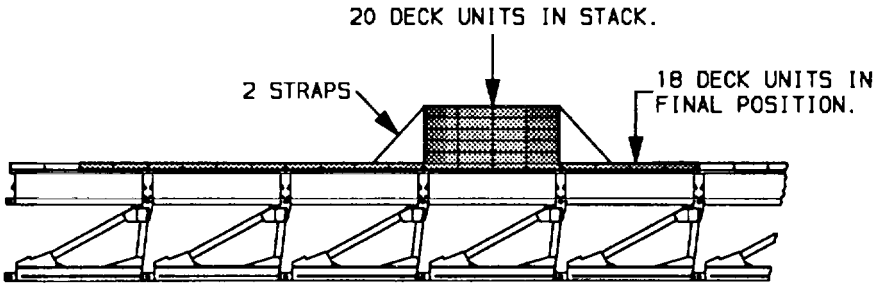
On 2E + 19 thru 2E + 22 bay double story bridges without link reinforcement, twenty deck units and six curbs are placed on the rear end of bridge as counterweight.

Eight deck units are placed in their final position on the end of bridge. Two curbs are placed on the bankseat beam and four curbs on the top panels to retain the counterweight. The additional twelve deck units are placed on decking, eight laid flat and four on edge leaning in toward deck units, as shown.



6-10. 2E + 13 thru 2E + 18 w/o LRS - RESTRICTED SITE

On 2E + 13 thru 2E + 18 bay double story bridges without link reinforcement on a restricted site, thirty eight deck units are used as counterweight. Eighteen deck units are placed in their final position and the remaining twenty stacked on one bay of the bridge and secured with straps.



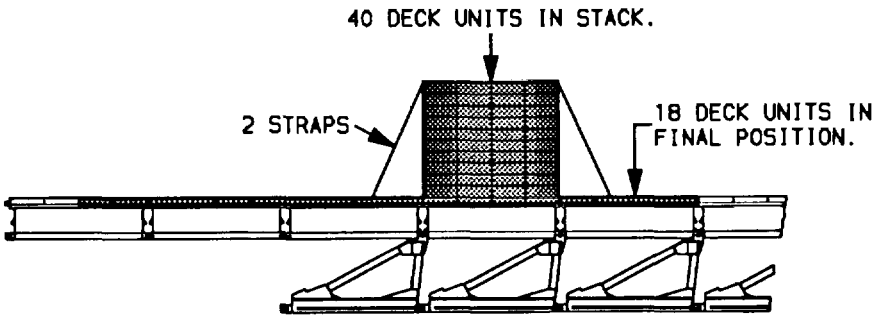
BRIDGE LENGTH	STACK 20 ON BAY	FINAL POSITION 18 ON BAY
13	7	4*, 5, 6, 7,8
14	8	5*,6,7,8,9
15	9	6*,7,8,9,10
16	11	8*, 9, 10, 11, 12
17	13	10*, 11,12,13,14
18	15	12*,13,14,15,16

* Only two deck units in this bay

6-11. 2E + 19 thru 2E + 22 w/o LRS - RESTRICTED SITE

On 2E + 19 thru 2E + 22 bay double story bridges without link reinforcement on a restricted site, counterweights are used in two stages.

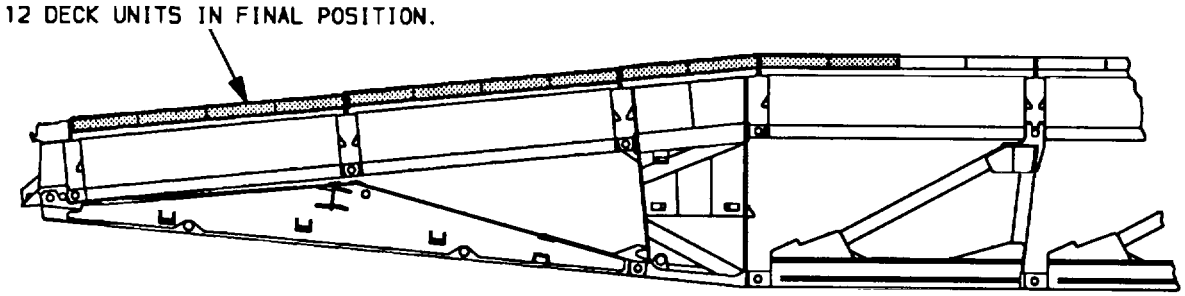
The first stage uses fifty eight deck units. Eighteen deck units are placed in their final position and the remaining forty stacked on one bay of the bridge and secured with straps.



BRIDGE LENGTH	STACK 40 ON BAY	FINAL POSITION 18 ON BAY
19	16	13*, 14,15,16,17
20	17	14*, 15,16,17,18
21	18	15*,16,17,18,19
22	19	16*,17,18,19, 20

* Only two deck units in this bay

The second stage uses twelve deck units placed in their final position at the end of bridge and on the last bay as shown below.



Section V. OVERBRIDGES - DOUBLE STORY

6-12. GENERAL

This section provides the information needed to construct overbridges in double story configuration. Over bridges are constructed over existing bridges that have been damaged or have a low class capacity. The abutments of the existing bridge are used as bearing points for the overbridge. It is important to ensure that the overbridge does not come into contact with the existing bridge span while traffic is crossing. Overbridges can be built with or without launching noses.

6-13. DESIGN

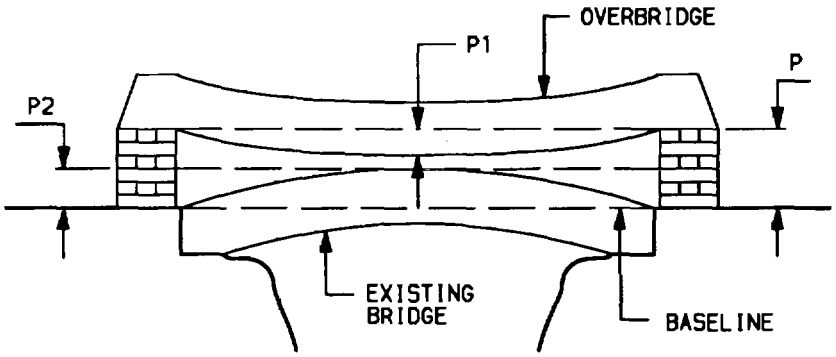
a. The design for overbridges constructed with launching noses is the same as a bridge being built over a gap. Particular attention must be paid to deflection of the far bank end of bridge and the launching nose cross girder setting.

b. For all overbridges, the amount of packing under the bankseat beam must be calculated using the following formula and steps (1) and (2) below:

P = P1 +P2

where:

P = Height of packing
P1 = Deflection of overbridge
P2 = Height of existing bridge above baseline through bearing points at ends of existing bridge.



(1) Measure height of existing bridge (P2) by using, the baseline joining the ground levels at the proposed locations of the BSBs as a datum.

(2) Find maximum deflection (P1) of overbridge to be constructed from the following table 6-30.

(3) Using information found in (1) and (2), determine amount of packing (P) to be used under the ends of the overbridge.

TABLE 6-24. Central and eccentric deflections - Double Story Bridges

SPAN feet (meters)	DEFLECTION inches (mm)		
	DEAD LOAD	DEAD LOAD + LIVE LOAD (CENTRAL)	DEAD LOAD + LIVE LOAD (ECCENTRIC)
37 (11.3)	0.5 (13)	0.75 (19)	0.75 (19)
43 (13.1)	0.5 (13)	1 (25)	1 (25)
49 (14.9)	0.75 (19)	1.5 (38)	1.5 (38)
55 (16.8)	1 (25)	2.0 (51)	2.25 (57)
61 (18.6)	1.25 (32)	3.25 (70)	3.0 (76)
67 (20.4)	1.5 (38)	3.75 (83)	3.75 (95)
73 (22.3)	2.0 (51)	4.25 (108)	4.75 (121)
79 (24.1)	2.5 (64)	5.25 (133)	6.0 (152)
85 (25.9)	3.0 (76)	6.5 (165)	7.25 (184)
91 (27.7)	3.5 (89)	8.0 (203)	9.0 (229)
97 (29.6)	4.0 (102)	9.5 (241)	10.5 (273)
103 (31.4)	4.75 (121)	11.5 (292)	13 (330)

Tracked vehicle of maximum load class allowed.

6-14. ASSEMBLY

a. Assembly Using a Launching Nose

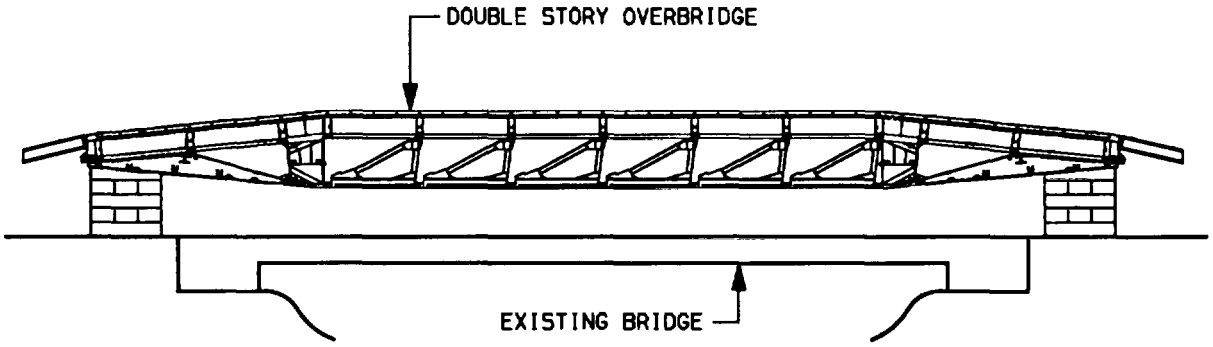
With launching noses, an overbridge is built as if it was being put across a gap. The roller beam closest to the existing bridge must be positioned so that it does not touch the existing span. Also, the roller beam height should be kept high enough to prevent the launching nose, or far bank end of bridge, from coming into contact with the existing span.

(1) Set up rear roller beam/front roller beam clear of the span to be bridged.

(2) Assemble and launch bridge as though bridging a gap.

b. Assembly Without a Launching Nose (2E + 3 through 2E + 12 bay double story)

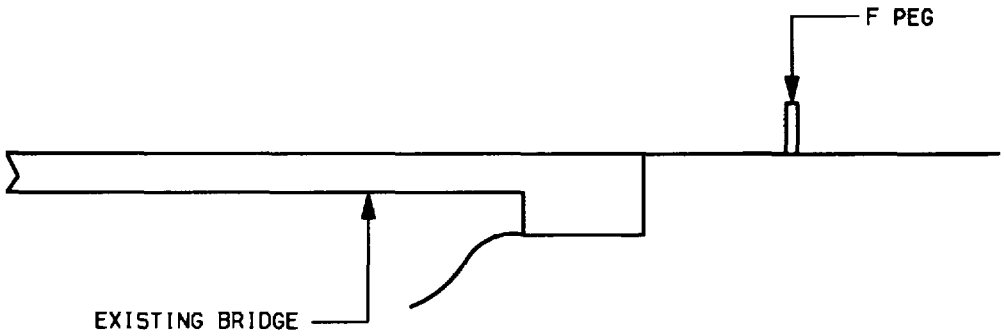
Without launching noses, an overbridge is built in place over the existing span. Ensure that the existing span is capable of supporting the weight of the overbridge during construction, particularly if it is being constructed over a long, low class bridge.



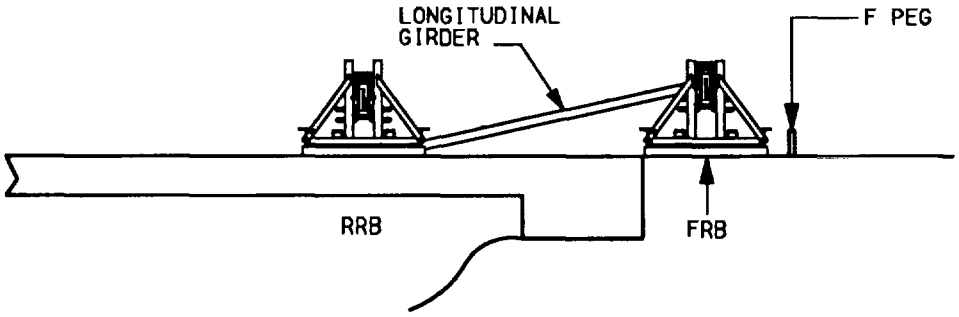
NOTE

Packing can be used instead of roller beams, if the site is absolutely level. Jacking takes place centrally under the panels at the jaw blocks, and all packing is of equal height.

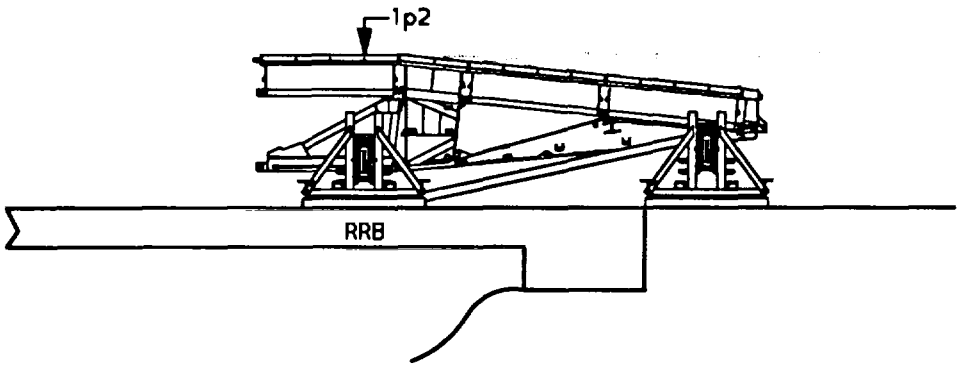
(1) Mark far end of bridge position.



(2) Assemble and position front and rear t roller beams. Lower longitudinal girders from rear roller beam to ground.

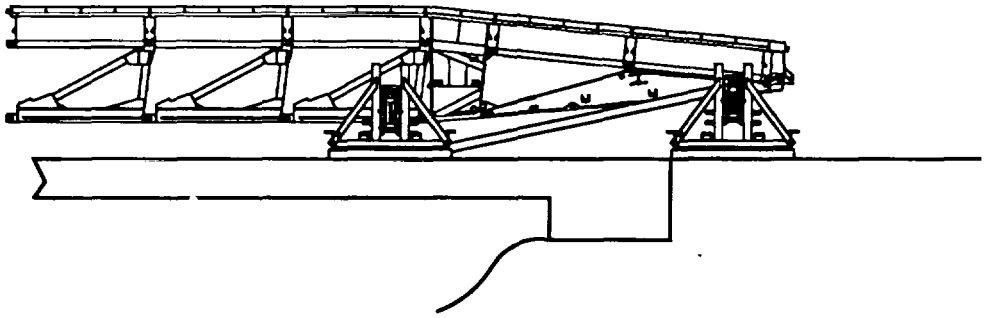


(3) Build end of bridge and first bay on roller beams.

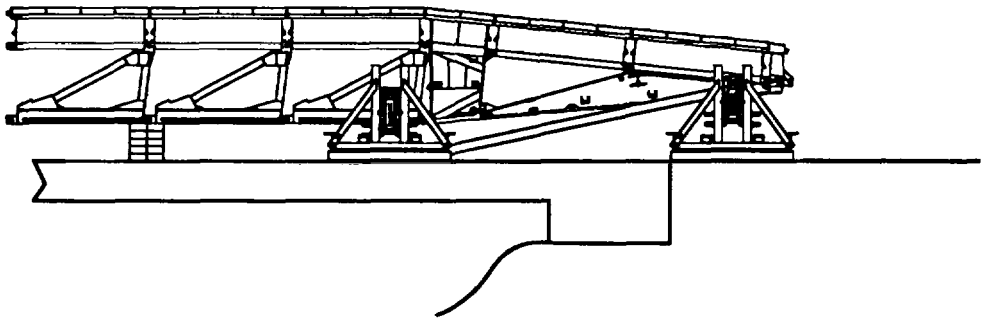


(4) Lower/raise (as needed) rear roller beam and front roller beam until bay 1 is at a suitable height to permit easy installation of additional bays. Level roller beams with carpenter's level

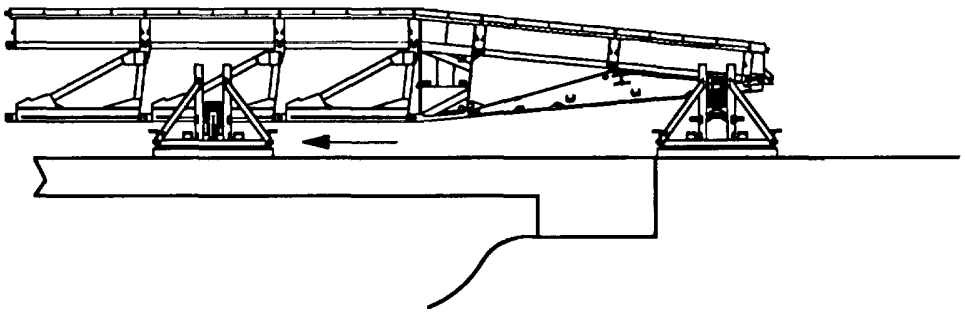
(5) Add bays 2 and 3.



(6) Jack up rear roller beam and place packing under junction between last two bays. Lower rear roller beam.

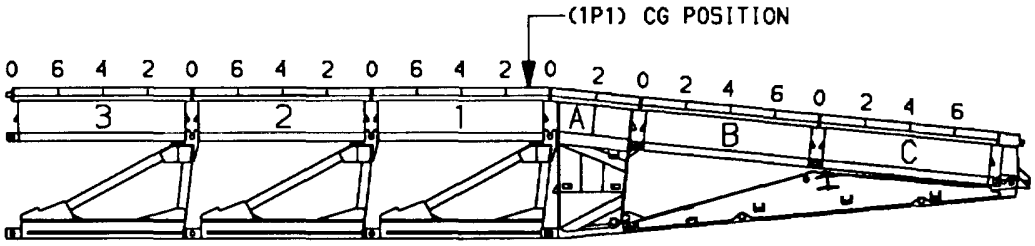


(7) Move rear roller beam close to packing, jack up rear roller beam, remove packing and lower rear roller beam.

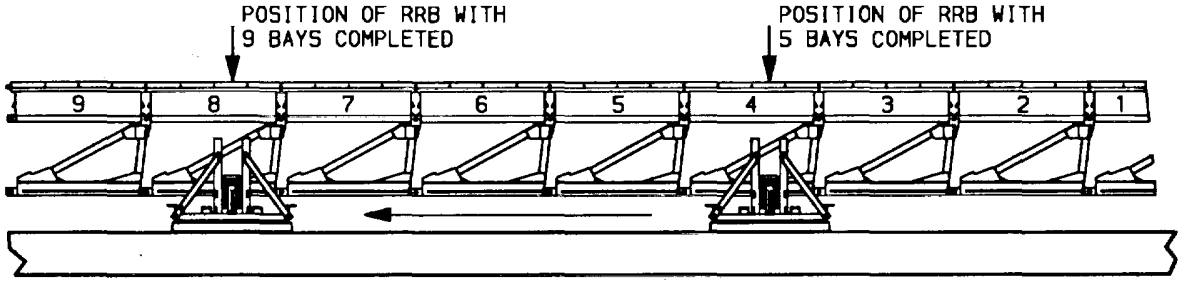


(8) Add further bays until CG is within 1pp of rear roller beam, or until reactions on baseplates are as much as existing bridge can sustain.

E + No of bays completed	1	2	3	4	5	6	7	8	9	10	11	12
	Bp3	Bp0	1p1	1p5	2p1	2p5	3p1	3p5	4p1	4p5	5p1	5p5



(9) Repeat process of adding bays, packing up, and moving rear roller beam until bridge girders are complete (including end of bridge).



(10) Jack up rear of bridge as needed to remove rear roller beam and to position required packing.

(11) Repeat (10) for front end of bridge.

(12) Place ramps, deck, curbs, guide markers, and classification signs.

(13) Clear site of all erection equipment.

Section VI. ANCHORAGE - DOUBLE STORY

This section provides the information used to determine if anchorage is needed, types of anchorages, and procedures for installation. The components used are listed in Appendixes D and E of this TM.

6-15. BASIC CONSIDERATIONS

a. The requirement for anchorage will be determined during site reconnaissance. Factors such as, slope of finished bridge, volume and type of traffic, and bank conditions will be used to determine if anchorage is required.

b. Slope of Finished Bridge. The steeper the slope of the finished bridge, the greater the possibility that anchorage is needed. Consider crossfall of bridge along with slope from end to end. Do not consider the above to mean that completely level bridges will not need anchorages, as the volume and type of traffic and bank conditions must also be considered. Bridges constructed on solid banks or on packing may creep under a high volume of traffic (especially armored, tracked vehicles). If anchorage is not installed, a bridge should be checked during crossing of traffic for any sign of creeping. If creeping is detected anchorage should be installed.

c. Volume and Type of Traffic. Heavy wheeled and tracked vehicles may cause the bridge to creep. This is the result of impact loads against the end of bridge, and braking/accelerating on the bridge. Control of vehicle approach speed and movement across the bridge will reduce these loads. High volume of medium to heavy vehicles in one direction may cause creeping. Stop vehicles prior to impact on the end of bridge, and instruct drivers to maintain a constant safe speed, not to shift gears, and not to make any sudden stops.

d. Bank Conditions. Banks that will allow slow settling of the end of the bridge will probably reduce the amount of creeping. Firm, solid banks will increase the need for anchorage.

e. Final Determination. After considering the basic factors, the final determination if anchorage is needed will be made by the bridge commander. If anchorage is not installed, the bridge will be checked regularly for any sign of creeping. If detected, the severity of creeping will be determined, and anchorage will be installed if deemed necessary.

6-16. TYPES OF ANCHORAGE

The types of anchorage used for MGB are Picket and Approach Guy.

a. Picket Type. Consists of pickets driven into the bank along the outside of the bankseat beams. This type of anchorage can be used for small (2E + 1 thru 2E + 12 bay) double story bridges. Picket type anchorage is installed after the bridge has been put on the ground at both ends, and before ramps are added. During crossing of traffic, check bridge for any sign of creeping.

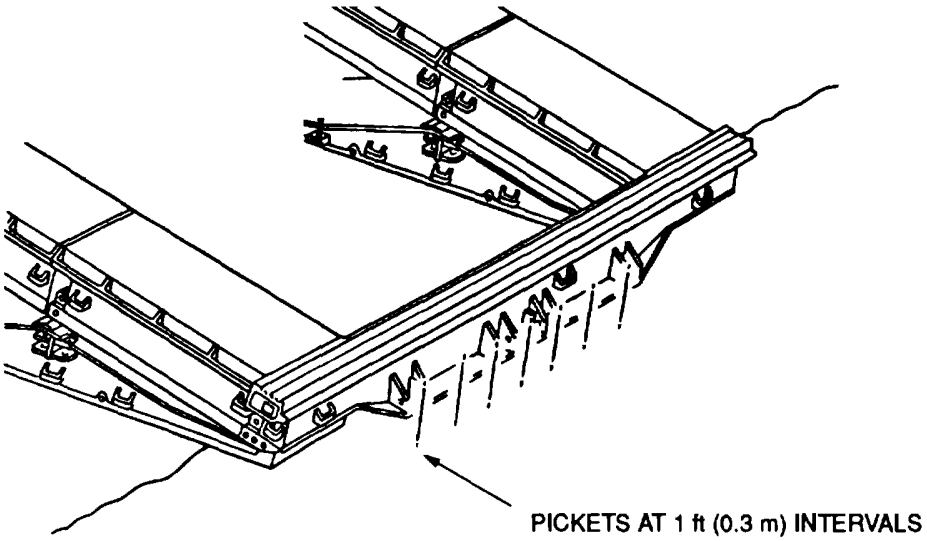
b. Approach Guy Type. Consists of anchorage cables attached to holdfasts at the bank end, and to anchorage pins in the bridge at the other end. Four cables can be used at each end of the bridge. This type of anchorage must be used for bridges 2E + 13 bay and over, with or without reinforcement. It can also be used for small bridges (2E +1 thru 2E + 12 bay).

NOTE

Anchorage installation should not Increase building time by more than one half of an hour.

6-17. PICKET TYPE INSTALLATION

Use hammer to drive pickets into bank at 1 ft (0.3m) intervals along the outside edge of near bankseat bream. Repeat this procedure for far bank bankseat beam.



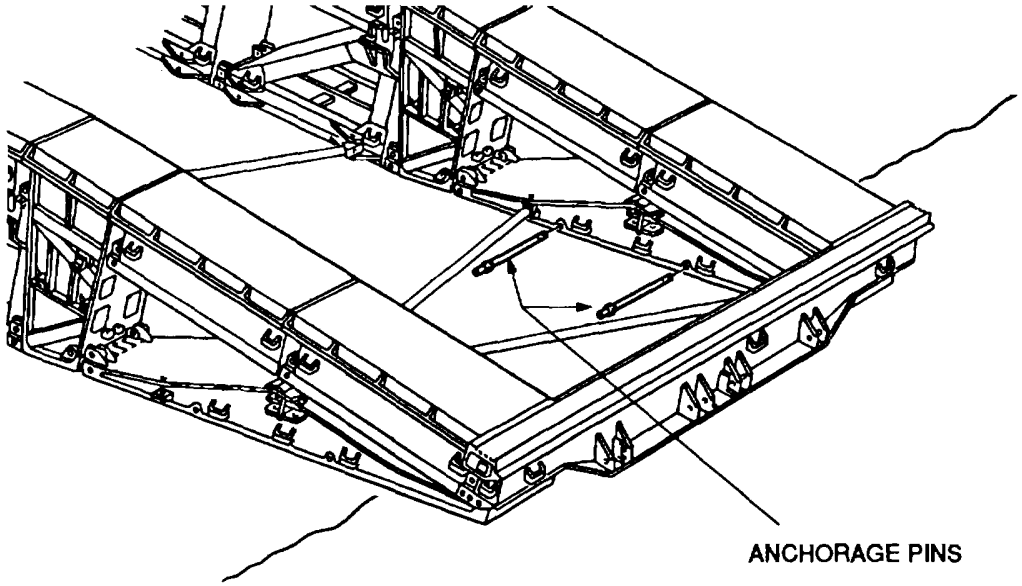
6-18. APPROACH GUY INSTALLATION

a. General

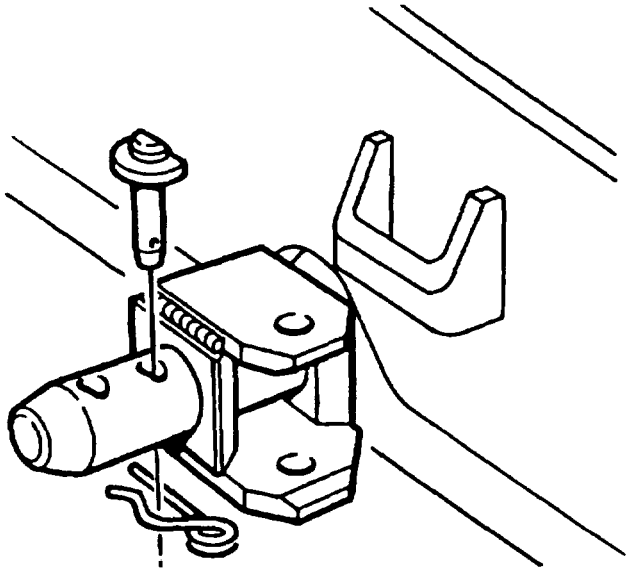
During installation, anchorage pins will be used in end taper panels for connection of approach guy cables. This type of anchorage is installed during construction, but can, if required, be installed once bridge is put on ground,

b. Installation

(1) Insert anchorage pins in anchorage pin holes in end taper panels of far bank end of bridge.



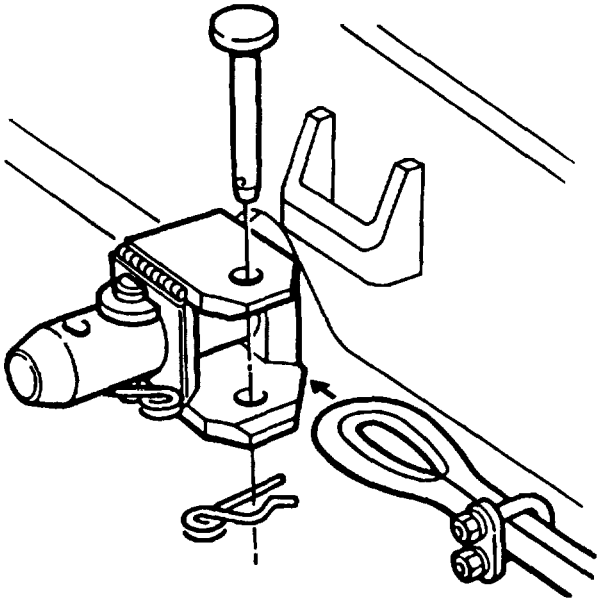
(2) Attach anchorage lug to end of each pin and secure with a retaining pin and retainer clip.



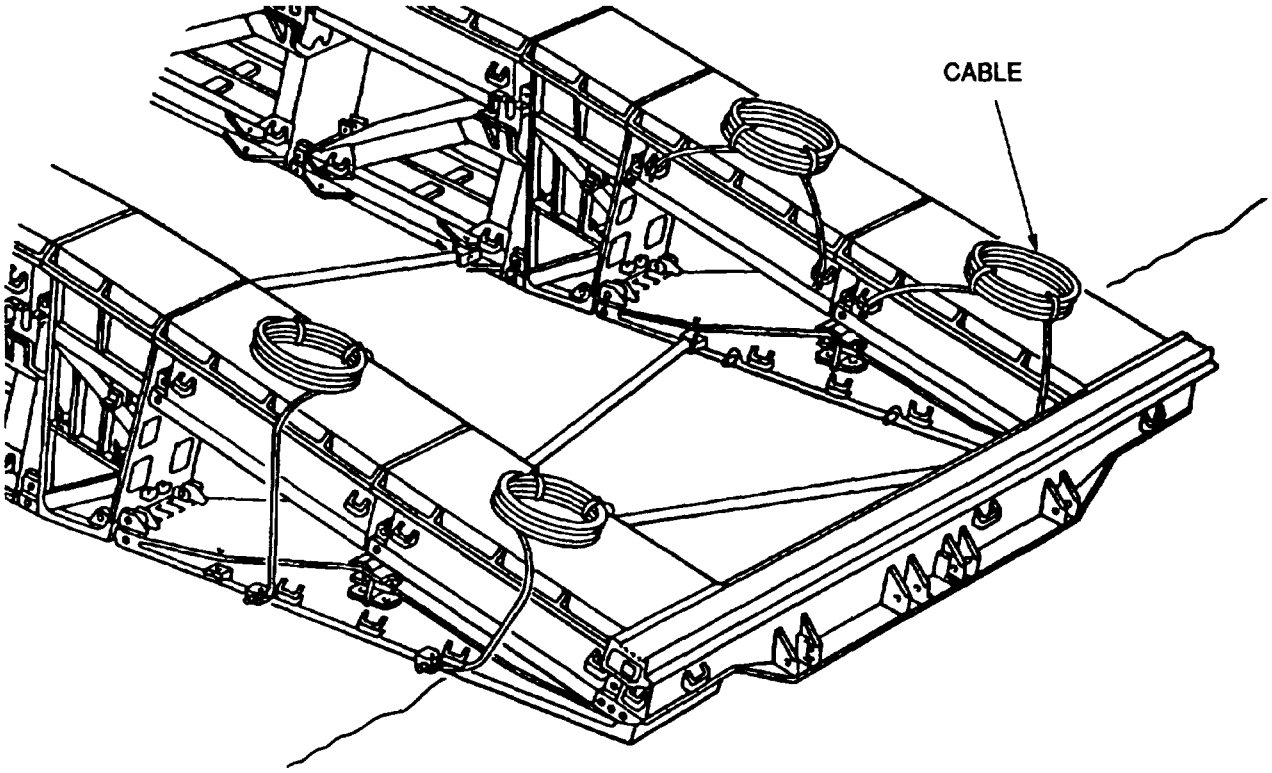
NOTE

Bridge must be boomed until anchorage pin is in front of roller beam nearest edge of gap, before lug can be attached.

(3) Attach loop of approach guy cable to lug with bracing pin and secure with retainer clip.



(4) Coil cable on top of panel and secure to carrying bar bracket with light rope.



(5) Insert near bank anchorage pins in anchorage pin holes in end taper panels of near bank end of bridge [as in step (1)].

(6) Attach anchorage lug to end of each pin and secure with retaining pin and retainer clip.

NOTE

Bridge must be boomed until anchorage pin is in front of roller beam nearest edge of gap, before lug can be attached [as In step (2)].

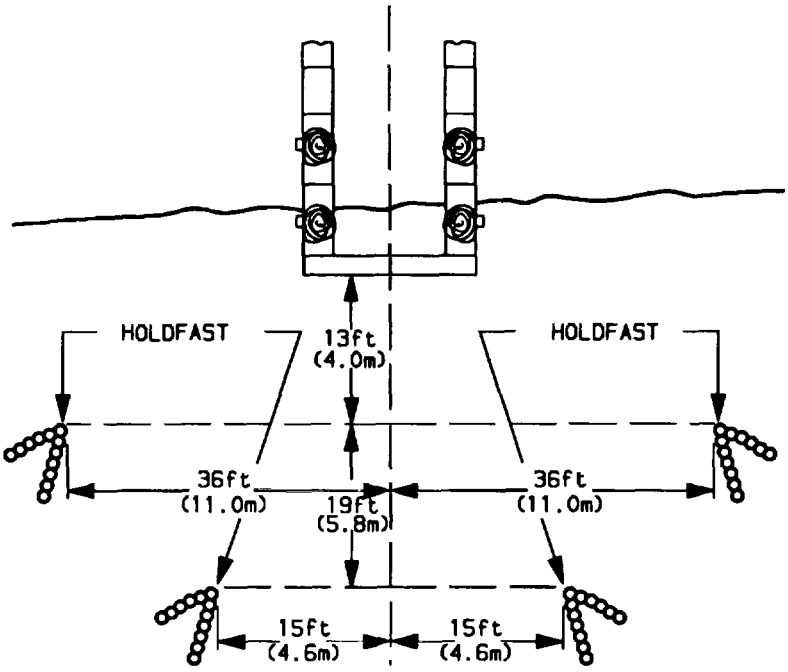
(7) Attach loop of approach guy cable to lug with bracing pin and secure with retainer clip [as in step (3)].

(8) Coil cable on top of panel and secure to carrying bar bracket with light rope [as in step (4)].

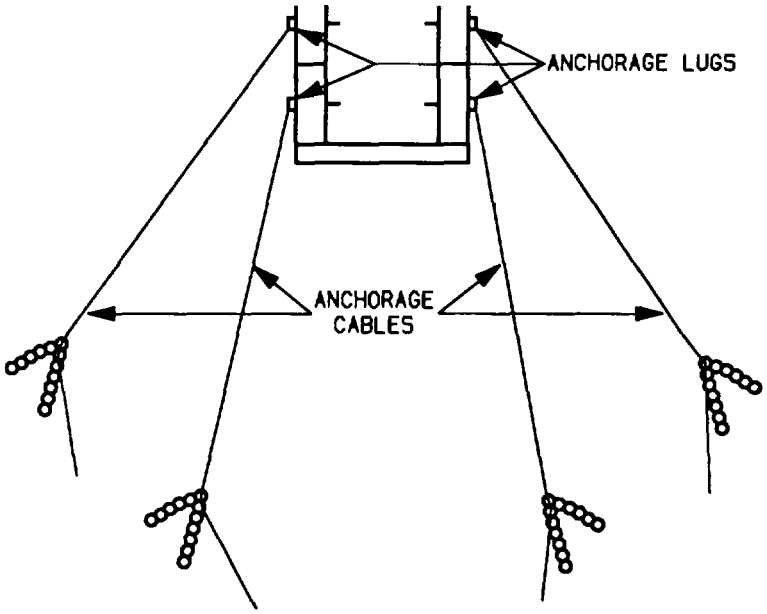
NOTE

The following step can be performed immediately after arrival on site, depending on the availability of personnel.

(9) Position chain holdfasts on site as shown. Drive nine pickets through links of each holdfast.

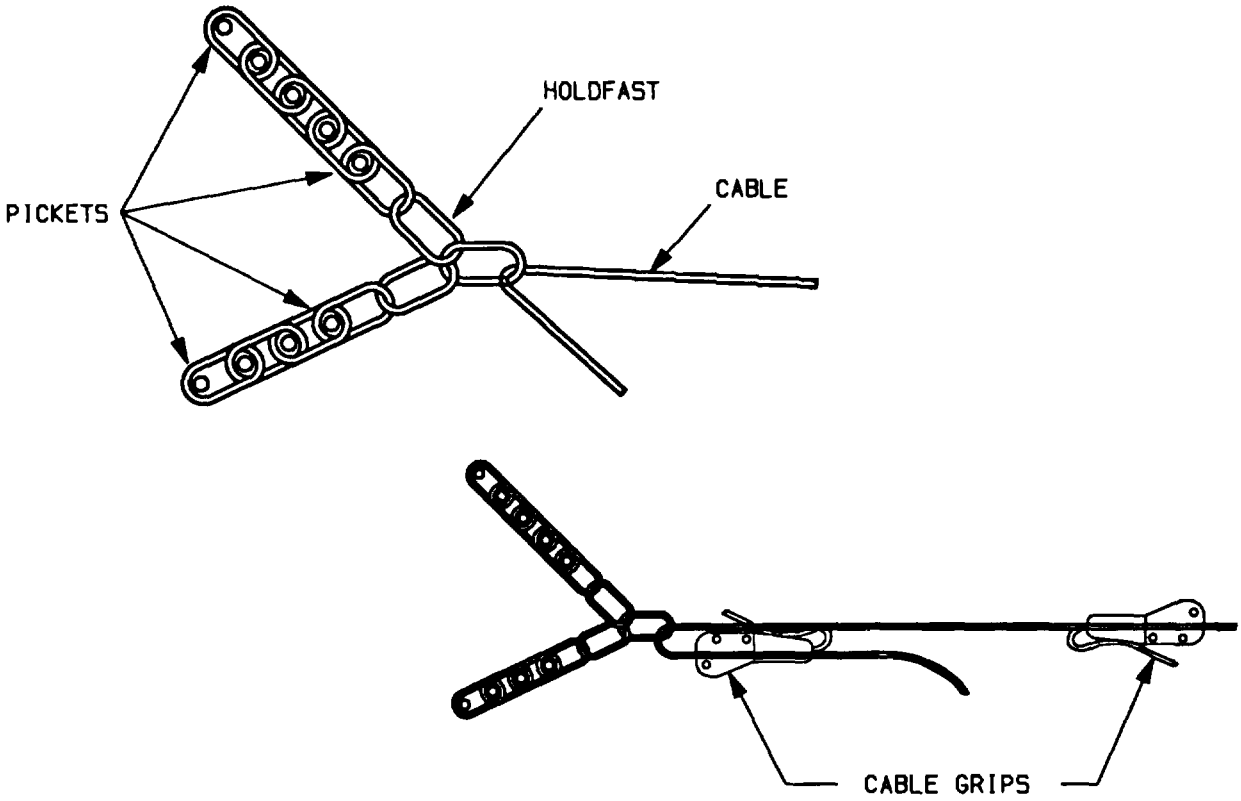


(10) After bridge is lowered to ground, remove and unroll coil(s) of cable(s) from top panels and stretch out toward holdfasts.



(11) Feed running end of cable through link of chain holdfast and take up slack by hand.

(12) Attach cable grips to cable as shown.

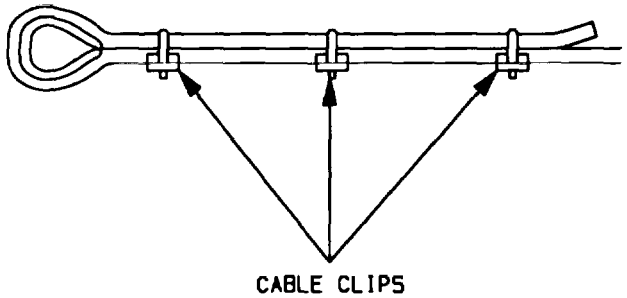


(13) Attach ratchet chain hoist to cable grips and operate chain hoist in unison to tension cables.

(14) Secure cable with minimum of three cable clips.

NOTE

Cable clips are always fitted as shown in sketch below, i.e. with the clamp and nut on the working portion of the cable.



(15) Remove ratchet chain hoist and cable grips.

CHAPTER 7

LINK REINFORCED BRIDGES

		Page
Section I.	GENERAL	7-1
Section II.	NORMAL SITES	7-14
7-1	ASSEMBLY 2E + 22 BAY- LINK REINFORCED	7-14
7-2	DISASSEMBLY - 2E + 22 BAY LINK REINFORCED	7-25
7-3	DISASSEMBLY ON ORIGINAL FAR BANK	7-34
Section III.	COUNTERWEIGHTS - LINK REINFORCED BRIDGES	7-38
7-4	2E + 19 BAY - NORMAL SITE	7-38
7-5	2E + 20 BAY - NORMAL SITE	7-38
7-6	2E + 21 BAY - NORMAL SITE	7-38
7-7	2E + 22 BAY - NORMAL SITE	7-39
Section IV.	ANCHORAGE - LINK REINFORCED BRIDGES	7-40

Section I. GENERAL

a. Introduction. The construction (assembly) and delaunch (disassembly) of link reinforced bridges is described in step by step procedures in this chapter.

The assembly procedures start with the setting up and alignment of the roller beam, followed by step by step assembly instructions to construct the bridge. Similarly, disassembly procedures contain full step by step instructions. Disassembly is not the exact reverse of assembly; there are differences, therefore the step by step procedures shall be followed carefully. These procedures are covered in more detail in Chapter 4 General Drills. The operator should be familiar with these drills before following the step by step procedures in this chapter.

When familiarity is gained with the general drills and the step by step procedures, any link reinforced bridge up to 2E + 22 bay can be assembled using the Build and Boom Tables, and disassembled using the Delaunch Tables.

WARNING

Do not attempt to use the Tables until the general drills and step by step procedures have been practiced a number of times.

TABLE 7-1. Building and Boom Table - 2E + 13 through 2E + 17 Bay Link Reinforced (Normal Site)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E+No. of Bays	13	14	15	16	17
L/Nose	7N1	7N1	7N1	8N1	8N1
Build E+1 with RRB at: Add (CG)	1p2 Note a 2,3 5N1*,4 5 7N1**,6 (Ap1)	1p2 Note a 2,3 5N1*,4 5 7N1**,6 (Ap1)	1p2 Note a 2,3 5N1*,4 5 7N1**,6 (Ap1)	1p2 Note a 2,3 5N1*,4 5 8N1**,6 (Ap3)	1p2 Note a 2,3 5N1*,4 5 8N1**,6 (Ap3)
Boom Add (CG)	3p0 7,8,9 (2p5)	3p0 7,8,9 (2p5)	3p0 7,8,9 (2p5)	2p7 7,8,9 (2p3)	2p7 7,8,9 (2p3)
Boom Add (CG)	4p7 10,11,12 (4p2)	4p7 10,11,12 (4p2)	4p7 10,11,12 (4p2)	4p5 10,11,12 (4p0)	4p5 10,11,12 (4p0)
Boom Add (CG)	10p0 AA(L) Note b (4p2)	10p0 AA(L) Note b (4p2)	10p0 AA(L) Note b (4p2)	10p0 AA(L) Note b (4p2)	10p0 AA(L) Note b (4p2)
Boom Add (CG)	11p0 AA(S) 13,E (6p0)	11p0 AA(S) 13,14,E (6p4)	11p0 AA(S) 13 thru E (7p0)	11p0 AA(S) 13 thru E (7p2)	11p0 AA(S) 13 thru E (7p7)
Boom Add			13p7 PT	13p7 PT	13p7 PT
Launch Position LRP Add	(6p0) LZ 7 Note c	(6p4) LZ 4 Note c PT	(7p0) LZ 3 Note c	(7p2) LZ 7 Note c	(7p6) LZ 5 Note c
Launch Add	6p2 PT				
Launch Add Remove	10p6 PT RRB,FRB	11p6 PT RRB,FRB	12p6 PT RRB,FRB	13p6 PT RRB,FRB	14p6 PT RRB,FRB
Launch Add	13p2 AA(S)	14p2 AA(S)	15p2 AA(S)	16p2 AA(S)	17p2 AA(S)
Launch Add	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)
Complete by:	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g

TABLE 7-1. (cont'd) Building and Boom Table - 2E + 13 through 2E + 17 Bay Link Reinforced (Normal Site)

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Stop boom/launch to add long or short links, light tackle and anti-flutter as required.
c. Check the LR is under the LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang.
   Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
d. Boom to 6 ft (1.8 m) from A peg or ETP overhangs CRB by min. 1.5 ft (0.5 m).
e. Install ex FRB in front of CRB and then reposition LRP 12 ft (3.6 m) from A peg.
f. Launch to required far bank bearing or until end of ETP overhangs ex FRB by 1.5 ft (0.5 m).
g. Put bridge on ground.
* Add given length of launching nose with LRP secured with tie-down strap.
** Nose completed by adding further LNH's.
( ) Center of gravity.

TABLE 7-2. Building and Boom Table - 2E + 18 through 2E + 22 Bay Link Reinforced (Normal Site)

Bridge ft. Length	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight		[8D]	[20D+6C]	[30D+6C]	[40D+6C]
Build E+1 with RRB at: Add (CG)	1p2 Note a 2,3 6N1*,4 5 3N2**,6 7 (Ap2)	1p2 Note a 2,3 6N1*,4 5 3N2**,6 7 (Ap2)	1p2 Note a 2,3 6N1*,4 5 3N2**,6 7 (Ap2)	1p2 Note a 2,3 6N1*,4 5 3N2**,6 7 (Ap2)	1p2 Note a 2,3 6N1*,4 5 3N2**,6 7 (Ap2)
Boom Add (CG)	2p7 8,9,10 (2p3)	2p7 8,9,10 (2p3)	2p7 8,9,10 (2p3)	2p7 8,9,10 (2p3)	2p7 8,9,10 (2p3)
Boom Add (CG)	4p5 11,12,13 (4p0)	4p5 11,12,13 (4p0)	4p5 11,12,13 (4p0)	4p5 11,12,13 (4p0)	4p5 11,12,13 (4p0)
Boom Add (CG)	10p0 AA(L) Note b (4p0)	10p0 AA(L) Note b (4p0)	10p0 AA(L) Note b (4p0)	10p0 AA(L) Note b (4p0)	10p0 AA(L) Note b (4p0)
Boom Add (CG)	11p0 AA(S) 14 thru 17 (6p0)	11p0 AA(S) 14 thru 17 (6p0)	11p0 AA(S) 14 thru 17 (6p0)	11p0 AA(S) 14 thru 17 (6p0)	11p0 AA(S) 14 thru 17 (6p0)
Boom Add (CG)	13p0 18,E (7p7)	13p0 18,19 (7p2)	13p0 18 thru 20 (7p7)	13p0 18 thru 21 (8p3)	13p0 18 thru 22 (8p7)
Boom Add (CG)	13p7 PT (7p6)	13p7 PT E,[8D] (8p5)	13p7 PT E,[20D+6C] (9p6)	13p7 PT (8p0)	13p7 PT (8p4)
Boom Add (CG)				15p0 E,[3D] (9p4)	15p4 E,[3D] (10p0)
Launch Position LRP	(8p0) LZ 9 Note c	(8p5) LZ 7 Note c	(9p6) LZ 7 Note c	(9P4) LZ 2 Note c	(10p0) LZ 2 Note c

TABLE 7-2. (cont'd) Building and Boom Table - 2E + 18 through 2E + 22 Bay Link Reinforced (Normal Site)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight		[8D]	[20D+6C]	[30D+6C]	[40D+6C]
Launch Add				15p0 [27D+6C]	15p0 [37D+6C]
Launch Add Remove	15p5 PT RRB	16p5 PT RRB	17p5 PT RRB	18p5 PT RRB	19p5 PT RRB
Launch Add Remove	18p2 AA(S) FRB	19p2 AA(S) FRB	20p2 AA(S) FRB	21p2 AA(S) FRB	22p2 AA(S) FRB
Launch Add	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)
Complete by:	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g	Note d,e,f,g

NOTES:

a. Add LNCG posts, LNCG and nose roller.
b. Stop boom/launch to add long or short links, light tackle and anti-flutter as required.
c. Check that LR is under LZ given or higher. Remove nose sections as they pass LRP, observing minimum 5 ft (1.5 m) overhang. Leave last three nose sections in place until far bank end of bridge has been lowered to ground.
d. Boom to 6 ft (1.8 m) from A peg or ETP overhangs CRB by min. 1.5 ft (0.5 m).
e. Install ex FRB in front of CRB and then reposition LRP 12 ft (3.6 m) from A peg.
f. Launch to required far bank bearing or until end of ETP overhangs ex FRB by 1.5 ft (0.5 m).
g. Reposition counterweight deck units to final position and put bridge on ground.

* Add given length of launching nose with LRP secured with tie-down strap.
** Nose completed by adding further LNH's.
[ ] Counterweight.
( ) Center of gravity.

TABLE 7-3. Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E+No. Bays	13	14	15	16	17
L/Nose	7N1	7N1	7N1	8N1	8N1
V Distance ft m	118.6 36.16	124.9 38.06	129.1 39.36	136.7 41.66	142.6 43.46
Build	Notes a thru f	Notes a thru f	Notes a thru f	Notes a thru f	Notes a thru f
Delaunch Add	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)
Delaunch Remove	13p2 AA(S)	14p2 AA(S)	15p2 AA(S)	16p2 AA(S)	17p2 AA(S)
Delaunch Remove Add	10p6 PT RRB,FRB	11p6 PT RRB,FRB	12p6 PT RRB,FRB	13p6 PT RRB,FRB	14p6 PT RRB,FRB
Boom Remove	6p2 PT				
Delaunch Recover Remove	(6p0) LRP	(6p4) LRP PT	(7p0) LRP	(7p2) LRP	(7p6) LRP
Boom Remove			13p7 PT	13p7 PT	13p7 PT
Boom Remove	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)
Boom Remove	10p0 AA(L) E,13	10p0 AA(L) E,14,13	10p0 AA(L) E thru 13	10p0 AA(L) E thru 13	10p0 AA(L) E thru 13
Boom Remove (CG)	4p7 12,11,10 (2p5)	4p7 12,11,10 (2p5)	4p7 12,11,10 (2p5)	4p5 12,11,10 (2p3)	4p5 12,11,10 (2p3)
Boom Remove (CG)	3p0 9,8,7 (Ap1)	3p0 9,8,7 (Ap1)	3p0 9,8,7 (Ap1)	2p7 9,8,7 (Ap3)	2p7 9,8,7 (Ap3)
Boom Remove (CG)	1p2 6,7N1,6N1 5 4,5N1* 3,2 (Bp3)	1p2 6,7N1,6N16, 5 4,5N1* 3,2 (Bp3)	1p2 6,8N1,7N1 5 4,5N1* 3,2 (Bp3)	1p2 6,8N1,7N1 6N1,5 4,5N1* 3,2 (Bp3)	1P2 6,8N1,7N1 6N1,5 4,5N1* 3,2 (Bp3)
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete by:	Note g	Note g	Note g	Note g	Note g

TABLE 7-3. (cont'd) Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced

NOTES:

a. Remove curbs, ramps and deck units.
b. Position ex. FRB under bridge min.1.5 ft (0.5 m) from end.
c. Add LNCG posts, LNCG, nose roller and install launching nose, then reposition LRP 12 ft from A peg.
d. Delaunch bridge until far BSB is 6 ft (1.8 m) from A peg or end of ETP overhangs CRB by min. 1.5 ft (0.5 m)
e. Reposition LRP against A peg and then remove ex. FRB.
f. Stop boom/delaunch to remove long or short links, light tackle, anti-flutter and add launching noses as required, observing minimum 5 ft (1.5 m) overhang.
g. Disassemble FRB and RRB. Clear site.
* Remove remainder of launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 7-4. Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight		[8D]	[20D+6C]	[30D+6C]	[40D+6C]
V Distance ft m	148.8 45.36	154.7 47.16	160.6 48.96	165.2 50.36	168.8 51.45
Build	Notes a thru f	Notes a thru f	Notes a thru f	Notes a thru f	Notes a thru f
Delaunch Remove	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)	Dp2 AA(L)
Delaunch Remove Add	18p2 AA(S) FRB	19p2 AA(S) FRB	20p2 AA(S) FRB	21p2 AA(S) FRB	22p2 AA(S) FRB
Delaunch Remove Add	15p5 PT RRB	16p5 PT RRB	17p5 PT RRB	18p5 PT RRB	19p5 PT RRB
Delaunch Remove				15p0 [27D+6C]	15p0 [37D+6C]
Delaunch Recover	(8p0) LRP	(8p5) LRP	(9p6) LRP	(9p4) LRP	(10pO) LRP
Boom Remove (CG)				15p0 E,[3D] (8p0)	15p4 E,[3D] (8p4)
Boom Remove PT (CG)	13p7 PT (7p7)	13p7 E,[8D] PT (7p0)	13p7 E,[20D+6C] PT (7p4)	13p7 PT (8p0)	13p7 PT (6p0)
Boom Remove (CG)	13p0 E,18 (6p0)	13p0 19,18 (6p0)	13p0 20,19,18 (6p0)	13p0 21 thru18 (6p0)	13p0 22 thru18 (6p0)
Boom Remove	11p0 AA(S) 17 thru 14	11p0 AA(S) 17 thru 14	11p0 AA(S) 17thru 14	11p0 AA(S) 17thru 14	11p0 AA(S) 17 thru 14
Boom Remove (CG)	10p0 AA(L) (4p0)	10p0 AA(L) (4p0)	10p0 AA(L) (4p0)	10p0 AA(L) (4p0)	10p0 AA(L) (4p0)
Boom Remove (CG)	4p5 13,12,11 (2p3)	4p5 13,12,11 (2p3)	4p5 13,12,11 (2p3)	4p5 13,12,11 (2p3)	4p5 13,12,11 (2p3)
Boom Remove (CG)	2p7 10,9,8 (Ap2)	2p7 10,9,8 (Ap2)	2p7 10,9,8 (Ap2)	2p7 10,9,8 (Ap2)	2p7 10,9,8 (Ap2)

TABLE 7-4. (cont'd) Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1 +3N2	6N1+3N2	6N1+3N2	6N1+3N2
V Distance ft m	148.8 45.36	154.7 47.16	160.6 48.96	165.2 50.36	168.8 51.45
Boom Remove (CG)	1p2 7 6,3N2** 5 4,6N1* 3,2 (Bp3)	1p2 7 6,3N2** 5 4,6N1* 3,2 (Bp3)	1p2 7 6,3N2** 5 4,6N1* 3,2 (Bp3)	1p2 7 6,3N2** 5 4,6N1* 3,2 (Bp3)	1p2 7 6,3N2** 5 4,6N1* 3,2 (Bp3)
Boom Remove	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E	Bp2 1,E
Complete by:	Note g	Note g	Note g	Note g	Note g

NOTES:

a. Remove curbs, ramps and deck units and add counterweight if required.
b. Position ex. FRB under bridge min.1.5 ft (0.5 m) from end.
c. Add LNCG posts, LNCG, nose roller and install launching nose, then reposition LRP 12 ft from A peg.
d. Delaunch bridge until far BSB is 6 ft (1.8 m) from A peg or end of ETP overhangs CRB by min. 1.5 ft (0.5 m)
e. Reposition LRP against A peg and then remove ex. FRB.
f. Stop boom/delaunch to remove long or short links, light tackle, anti-flutter and add launching noses as required, observing minimum 5 ft (1.5 m) overhang.
g. Disassemble FRB and RRB. Clear site.
** Remove double story launching nose.
* Remove remainder of launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 7-5. Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced
(Normal Site - Original Far Bank)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E+No. Bays		13	14	15	16
L/Nose	7N1	7N1	7N1	8N1	8N1
V Distance ft m	118.6 36.16	124.9 38.06	129.1 39.36	136.7 41.66	142.6 43.46
Build	Notes a thru g	Notes a thru g	Notes a thru g	Notes a thru g	Notes a thru g
Delaunch Add	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)
Delaunch Remove	13p2 AA(S)	14p2 AA(S)	15p2 AA(S)	16p2 AA(S)	17p2 AA(S)
Delaunch Add	12p2 FRB	13p2 FRB	14p2 FRB	15p2 FRB	16p2 FRB
Delaunch Remove Add	10p6 PT RRB	11p6 PT RRB	12p6 PT RRB	13p6 PT RRB	14p6 PT RRB
Delaunch Remove	6p2 PT				
Delaunch Recover Remove	(6p0) LRP	(6p4) LRP PT	(7p0) LRP	(7p2) LRP	(7p6) LRP
Boom Remove			13p7 PT	13p7 PT	13p7 PT
Boom Remove	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)
Boom Remove (CG)	10p0 AA(L) E thru l2 BP11 (3p4)	10p0 AA(L) E thru 12 BP11 (3p4)	10p0 AA(L) E thru 12 BP11 (3p4)	10p0 AA(L) E thru 13 BP12 (3p6)	10p0 AA(L) E thru 13 BP12 (3p6)
Boom Remove (CG)	4p0 TP11,10 BP9 (2p3)	4p0 TP11,10 BP9 (2p3)	4p0 TP11,10 BP9 (2p3)	4p5 TP12,11 BP10 (2p5)	4p5 TP12,11 BP10 (2p5)
Boom Remove (CG)	3p0 TP9,8 BP7 (1p2)	3p0 TP9,8 BP7 (1p2)	3p0 TP9,8 BP7 (1p2)	3p0 TP10,9, BP8 (1p4)	3p0 TP10,9, BP8 (1p4)

TABLE 7-5. (cont'd) Delaunch Table - 2E + 13 through 2E + 17 Bay Link Reinforced
(Normal Site - Original Far Bank)

Bridge ft Length m	108 32.9	114 34.8	120 36.6	126 38.4	132 40.2
2E+No. Bays	13	14	15	16	17
L/Nose	7N1	7N1	7N1	8N1	8N1
V Distance ft m	118.6 36.16	124.9 38.06	129.1 39.36	136.7 41.66	142.6 43.46
Boom Remove	1p7 TP7,BP6,7N1 TP6,BP5 TP5,BP4,6N1*	lp7 TP7,BP6,7N1 TP6,BP5 TP5,BP4,6N1*	1p7 TP7,BP6,7N1 TP6,BP5 TP5,BP4,6N1*	1p7 TP8,BP7,8N1 TP7,BP6,7N1 TP6,BP4,6N1*	lp7 TP8,BP7,8N1 TP7,BP6,7N1 TP6,BP4,6N1*
Boom Remove	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete by:	Note i	Note i	Note i	Note i	Note i

NOTES:

a. Remove curbs, ramps and deck units.
b. Skid bridge to correct bearing.
c. Position ex FRB under bridge 3 ft (0.9 m) from new A' peg. Bridge should overhang ex FRB min. 1.5 ft (0.5 m)
d. Position CRB next to ex FRB.
e. Add LNCG posts, LNCG, nose roller and install launching nose, then reposition LRP 12 ft from A peg.
f. Delaunch bridge until far BSB is 6 ft (1.8 m) from A peg or end of ETP overhangs CRB by minimum 1.5 ft (0.5 m)
g. Reposition LRP against new A peg and then remove ex. FRB.
h. Stop boom/delaunch to remove long or short links, light tackle, anti-flutter and add launching noses as required, observing minimum 5 ft (1.5 m) overhang.
i. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

TABLE 7-6. Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced
(Normal Site - Original Far Bank)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1+3N2	6N1+3N2	6N1 +3N2	6N1+3N2
Counterweight		[8D]	[20D+6C]	[30D+6C]	[40D+6C]
V Distance ft m	148.8 45.36	154.7 47.16	160.6 48.96	165.2 50.36	168.8 51.45
Build	Notes a thru g	Notes a thru g	Notes a thru g	Notes a thru g	Notes a thru g
Delaunch Remove	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)	Dp2 Note h AA(L)
Delaunch Remove Add	18p2 AA(S) FRB	19p2 AA(S) FRB	20p2 AA(S) FRB	21p2 AA(S) FRB	22p2 AA(S) FRB
Delaunch Remove Add	15p5 PT RRB	16p5 PT RRB	17p5 PT RRB	18p5 PT RRB	19p5 PT RRB
Delaunch Remove				15p0 [27D+6C]	15p0 [37D+6C]
Delaunch Recover	(8p0) LRP	(8p7) LRP	(9p5) LRP	(9p4) LRP	(10p0) LRP
Boom Remove (CG)					15p4 [3D],E (8p4)
Boom Remove (CG)	13p7 PT (7p7)	13p7 [8D],E PT (8pl)	13p7 [20D+6C],E PT (7p5)	13p7 [3D],E PT (8p2)	13p7 PT (6p0)
Boom Remove (CG)	13p0 E,BP18 (6p3)	13p0 19,BP18 (6p2)	13p0 20,19,BP18 (6p2)	13p0 21 thru19 BP18 (6p2)	13p0 22 thrul9 BP18 (6p0)
Boom Remove	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)	11p0 AA(S)
Boom Remove (CG)	10p0 AA(L) TP18 17 thru 14 BP13 (3p6)	10p0 AA(L) TP18 17 thru 14 BP13 (3p6)	10p0 AA(L) TP18 17 thru 14 BP13 (3p6)	10p0 AA(L) TP18 17 thru 14 BP13 (3p6)	10p0 AA(L) TP18 17 thru 14 BP13 (3p6)

TABLE 7-6. (cont'd) Delaunch Table - 2E + 18 through 2E + 22 Bay Link Reinforced
(Normal Site - Original Far Bank)

Bridge ft Length m	138 42.1	144 43.9	150 45.7	156 47.6	162 49.4
2E+No. of Bays	18	19	20	21	22
L/Nose	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2	6N1+3N2
Counterweight		[8D]	[20D+6C]	[30D+6C]	[40D+6C]
V Distance ft m	148.8 45.36	154.7 47.16	160.6 48.96	165.2 50.36	168.8 51.45
Boom Remove (CG)	4p3 TP13,12 BP11 (2p6)	4p3 TP13,12 BP11 (2p6)	4p3 TP13,12 BP11 (2p6)	4p3 TP13,12 BP11 (2p6)	4p3 TP13,12 BP11 (2p6)
Boom Remove (CG)	3p0 TP11,10 BP9 (1p4)	3p0 TP11,10 BP9 (1p4)	3p0 TP11,10 BP9 (1p4)	3p0 TP11,10 BP9 (1p4)	3p0 TP11,10 BP9 (1p4)
Boom Remove	1 p7 TP9 8,BP7,3N2 TP7,6 5,BP4,6N1*	1p7 TP9 8,BP7,3N2 TP7,6 5,BP4,6N1*	1 p7 TP9 8,BP7,3N2 TP7,6 5,BP4,6N1*	1p7 TP9 8,BP7,3N2 TP7,6 5,BP4,6N1*	1p7 TP9 8,BP7,3N2 TP7,6 5,BP4,6N1*
Boom Remove	2p0 Pin at A	2p0 Pin at A	2Po Pin at A	2p0 Pin at A	2p0 Pin at A
Boom Remove	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2	1p4 TP4,BP3 TP3,BP2	114 p4 TP4,BP3 TP3,BP2	 TP4,BP3 TP3,BP2
Boom Remove	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1	Bp0 TP2,1
Boom Remove	Bp2 E	Bp2 E	Bp2 E	Bp2 E	Bp2 E
Complete by:	Note i	Note i	Note i	Note i	Note i

NOTES:

a. Remove curbs, ramps and deck units and add counterweight if required.
b. Skid bridge to correct bearing.
c. Position ex. FRB under bridge 3 ft (0.9 m) from new A' peg. Bridge should overhang ex FRB min.1.5 ft (0.5 m).
d. Position CRB next to ex FRB.
e. Add LNCG posts, LNCG, nose roller and install launching nose, then reposition LRP 12 ft from A peg.
f. Delaunch bridge until far BSB is 6 ft (1.8 m) from A peg or end of ETP overhangs CRB by min. 1.5 ft (0.5 m)
g. Reposition LRP against new A peg and then remove ex. FRB.
h. Stop boom/delaunch to remove long or short links, light tackle, anti-flutter and add launching noses as required, observing minimum 5 ft (1.5 m) overhang.
i. Disassemble FRB and RRB. Clear site.
* Remove entire launching nose, LNCG, LNCG posts and nose roller.
( ) Center of gravity.

Section II. NORMAL SITES.

7-1. ASSEMBLY 2E + 22 BAY-LINK REINFORCED

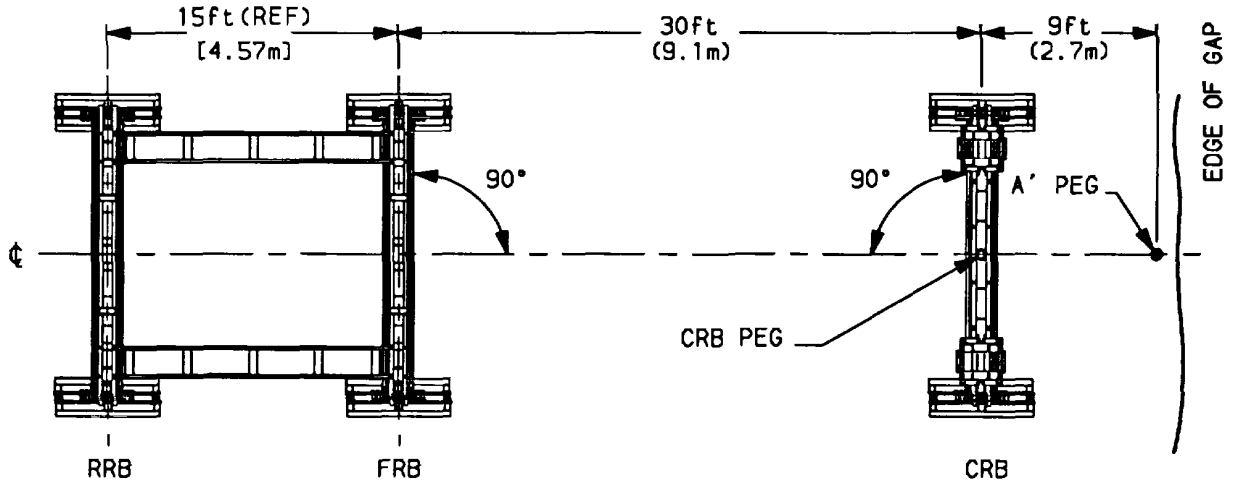
a. Set Up and Align Roller Beams

(1) Assemble capsill roller beam (CRB) front roller beam (FRB) and rear roller beam (RRB) and position on site as shown (para. 4-5c.).

(2) Lock FRB and RRB rollers; lock capsill roller beam rocking rollers (para. 4-5).

CAUTION

It is very Important that roller beams be correctly positioned at this time. If they are not, serious problems will arise during construction due to the bridge deviating from the centerline.

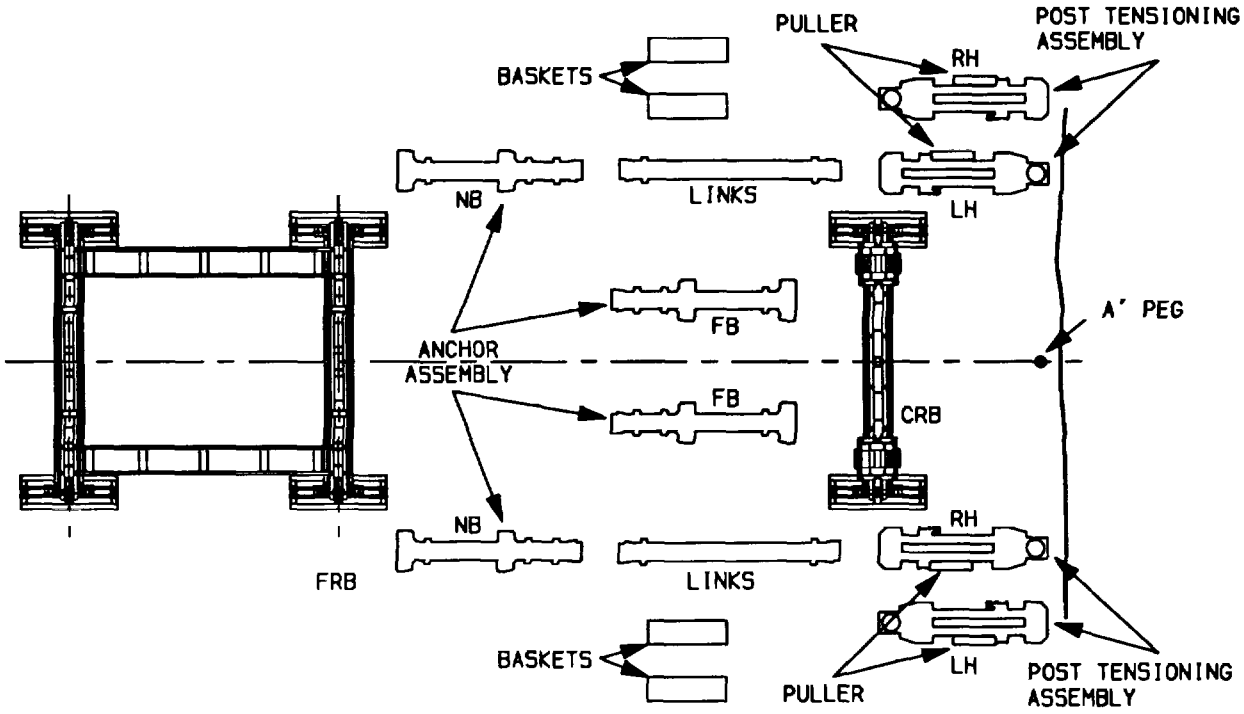


b. Assembly

NOTE

Throughout bridge assembly the NCOIC must monitor the height and level of the roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Position link components on site in preparation for assembly.



(2) Check post tensioning assemblies (para. 4-16b.).

(a) Ensure right hand (RH) and left hand (LH) are positioned as shown.

(b) Ensure they are complete and ready for operation.

(c) Check pullers and tackle blocks and make sure they are fitted on the correct outer position for the side of bridge the post tensioners are to be placed.

(3) Check anchor assemblies.

(a) Ensure assemblies are complete.

(b) Ensure far bank assemblies are positioned with junction block farthest from capsill roller beam and near bank assemblies positioned with junction block facing edge of gap.

(4) Stack links one on top of another.

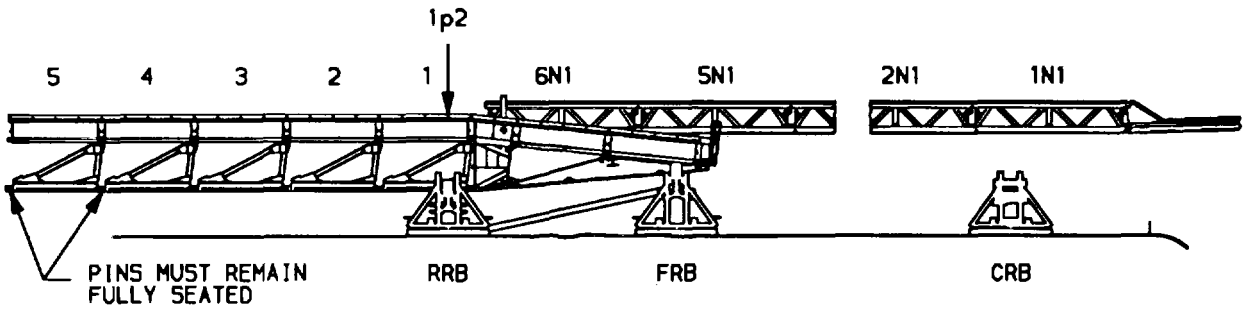
(5) Assemble end of bridge, launching nose up to 6N1 and bays 1 to 5 in the same way as when constructing a 2E + 12 bay double story bridge [para. 6-1b. steps (1) thru (10) but DO NOT add a deck unit in bay 1].

NOTE

A landing roller pedestal Mk 2, 20 ton hydraulic jack (fully extended), jack handle and four pieces of packing (3 In x 8 In x 36 In) are placed on the launching nose.

NOTE

The bottom panel pins at 5p0 and 6p0 must be watched to ensure they remain fully seated In pin jaws. Also bottom panel pins in last bay of bridge must be fully seated. If any of these pins are allowed to creep out during assembly, difficulty In attaching the post tensioning assemblies will arise.



(6) Add three double story heavy nose sections (1N2, 2N2, 3N2), booming nose forward and securing with panel pin as each double story nose is added (para. 4-12c.). Ensure that launching nose link is vertical.

(7) Add bays 6 and 7.

(8) Place a deck unit in third recess of bays 1 and 7.

(9) Ensure sway braces are installed in all bays.

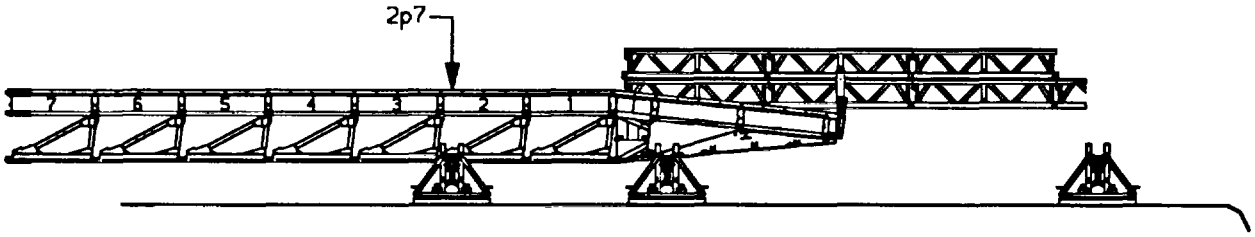
CAUTION

The following cautions should be observed each time the bridge is boomed. Do not allow the vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

NOTE

Throughout the build the bridge Is boomed using a vehicle, long push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(10) Connect push bar. Unlock rollers and boom bridge to 2p7 (over RRB). Lock rollers, and disconnect push bar.



(11) Add bays 8, 9 and 10, including sway braces.

(12) Connect push bar. Unlock rollers. Boom bridge to 4p5 (over RRB). Lock rollers, and disconnect push bar.

(13) Add bays 11, 12 and 13, including sway braces. Place one deck unit in third recess of bay 11.

(14) Connect push bar. Unlock rollers. Boom bridge as described below to 10p0 (over RRB). During this boom the front bankseat beam will approach capsill roller beam. This will occur as 5p4 passes over rear roller beam.

(a) Boom bridge until bankseat beam is within 1 ft (0.3 m) of capsill roller beam. Stop boom but do not lock rollers. Vehicle is holding bridge.

(b) Adjust height of capsill roller beam to slightly below leading edge of end taper panel. Do not remove support pins.

(c) Unlock rollers in capsill roller beam.

(d) Continue to boom slowly, watching end of bridge as it passes over capsill roller beam.

(e) Ensure capsill roller beam is level under bridge and square with end of bridge. Align capsill roller beam under exact same point on both sides of bridge.

NOTE

NCOIC will have to watch bridge during boom to make adjustments to roller beam heights to ensure that at end of boom, capsill roller beam is as high as possible (to ease addition of link components) and rear roller beam is at height that will permit easy construction at rear of bridge.

(f) Raise capsill roller beam to maximum height until there is full bridge contact

(g) Lower front roller beam to clear bottom of bridge. Do not remove jacks.

(h) Stop boom at 10p0 (over RRB). Do not disconnect vehicle. Do not lock rollers, vehicle is holding bridge.

(i) Raise or lower rear roller beam as needed to bring rear of bridge to a height that will make assembly of next bays as easy as possible and level capsill and rear roller beams.

(15) Fit anchor assembly and first long link (para. 4-16a. Note boom to 11pO).

(16) Add bays 14, 15, 16 and 17, including sway braces.

(17) Place one deck unit in third recess of bay 17.

(18) Connect push bar. Unlock rollers and boom bridge to 13p0 (over RRB). Lock rollers, and disconnect push bar.

(19) Add bays 18, 19, 20, 21 and 22, including sway braces.

NOTE

Ensure shoulders of pins at 18p0 and 19p0 are pushed fully home on both sides of bridge.

(20) Place one deck unit in third recess of bay 21.

(21) Attach light tackle to reinforcing link and bridge (para. 4-16c.).

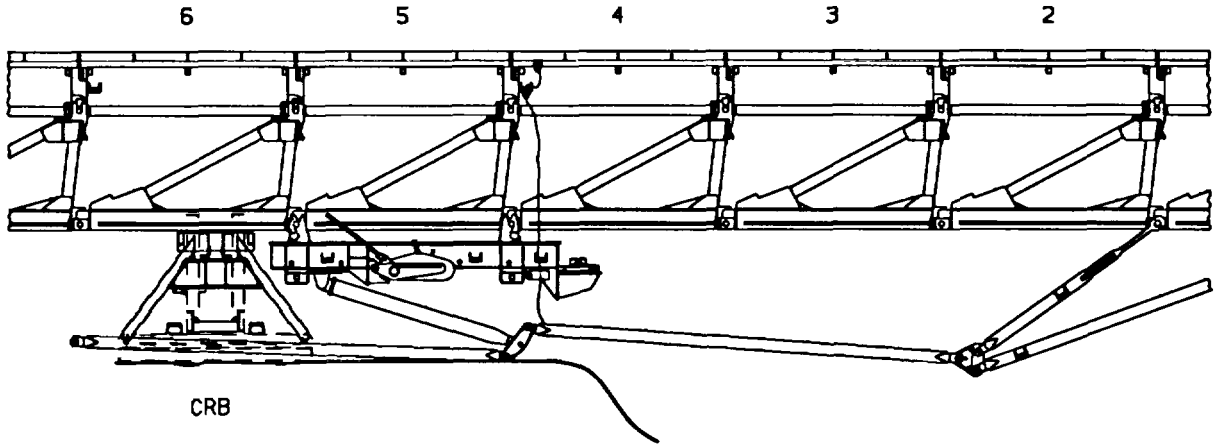
(22) Connect push bar. Unlock rollers and boom bridge to 13p7 (over RRB).

(23) Disconnect light tackle and lower link to ground.

(24) Add post tensioning assembly under bay 5, footwalk and second link. Ensure retainer clips are placed on each upper jaw (para. 4-16b.).

NOTE

Post tensioning assemblies can be right or left handed. Ensure that correct assembly is used. Pulley end of assembly must be toward closest bankseat beam with cable puller rigged on outside of bridge.



(25) Reconnect light tackle.

(26) Connect third and fourth long links.

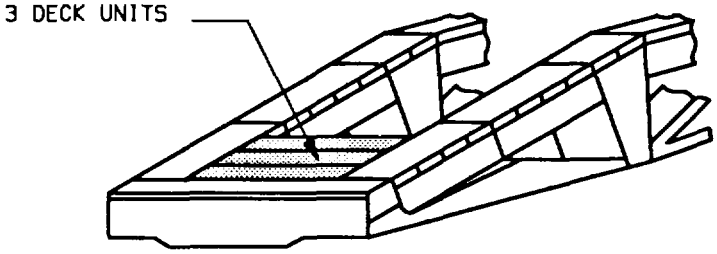
(27) Connect push bar. Unlock rollers and boom bridge to 15p4 (over RRB). Lock rollers, and disconnect push bar.

(28) Complete the end of bridge (para. 4-9b).

CAUTION

Counterweight deck units are required on 2E + 22 bay bridges. They are used in two stages, step (29) and step (35). Do not add counterweight until instructed. Failure to follow instructions can cause rear roller beam to collapse.

(29) Add three counterweight deck units.



(30) Fit light tackle to second reinforcing link and bridge.

WARNING

Launch is done with a vehicle and push bar. Once vehicle is connected to bridge it must not be disconnected until far bank end of bridge has been jacked down. Check push bar is correct way up. During launching, reinforcing links, light tackle and anti-flutter tackle will be added.

(31) Unlock rollers and launch bridge to 10p0 (over CRB). Do not lock rollers, the vehicle is used to hold bridge.

(32) Raise bridge, under control, until nose touches far bank.

CAUTION

A landing zone number two higher than the given LZ Is permitted. Never use an LZ number lower than that given for the bridge being constructed.

(33) Set up landing roller pedestal Mk2 against the A peg on far bank (para. 4-15a.) and check that LZ2 or higher is over center of LRP rollers (para. 4-4).

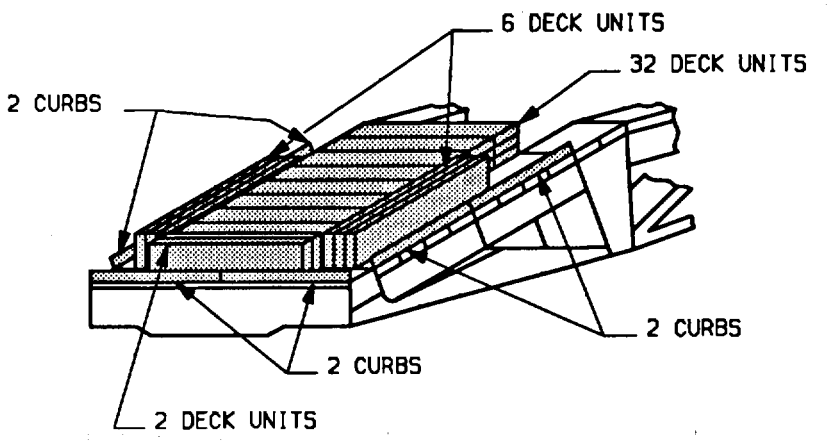
(34) Launch bridge to 15p0 (over CRB). During the launch:

(a) Add long links with light tackle on each long link.

(b) Add anti flutter tackle at 11pl.

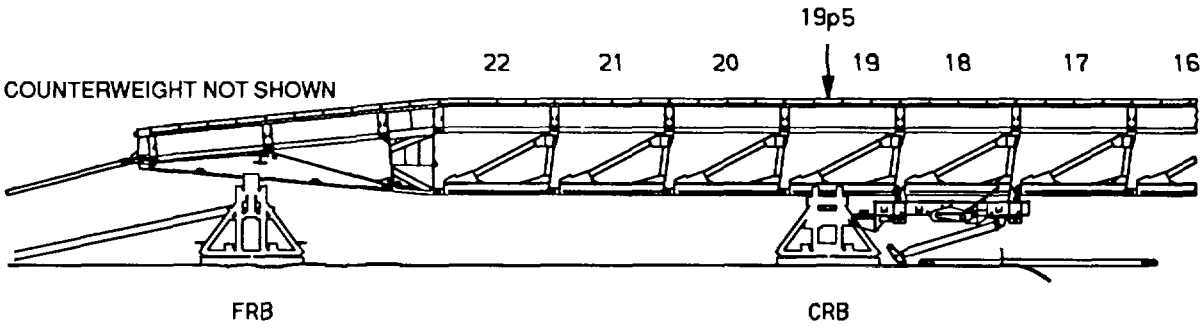
(c) Remove launching nose sections observing the 5 ft (1.5 m) minimum overhang (para. 4-13).

(35) Add thirty seven deck units and six curbs as counterweight, making a total counterweight of forty deck units and six curbs. Position a flat bed vehicle close to the end of bridge and use personnel standing on vehicle to transfer the counterweight from ground level up to personnel on the end of bridge.



(36) Launch bridge to 19p5 (over CRB), adding light tackle, long links and removing launching nose sections as described in step (34).

(37) Add post tensioning assembly under bay 18 and add light tackle. Ensure retainer clips are placed on each upper jaw.



(38) Place puller handle in well of bottom of bay 18.

(39) Remove launching nose pin securing post to frame. Use this pin in assembly of link [step (41)].

(40) Remove launching nose pin securing sliding block. Put this pin in well of bottom panel of bay 18 for use when pinning the post in tension position [step (67)].

(41) Fit connecting block of post to link number eight.

(42) Add ninth long link to link connecting block of post, feed link between cross girder and capsill beam. Fit light tackle.

(43) Fit footwalk bearers, footwalk, footwalk posts and guard rope [para. 4-16b. steps (9) thru (12)].

(44) Remove and disassemble rear roller beam.

(45) Launch bridge to 22p2 (over CRB) removing launching nose sections during launch.

(46) Remove and disassemble front roller beam.

(47) Position anchor assembly under bridge in front of capsill roller beam with junction block toward gap.

(a) Fork end anchors should be in transit position.

(b) Timber packing (3 in x 8 in x 84 in) must be placed on roller beam cross girder and under fork end anchor of anchor assembly.

(48) Connect ninth long link to anchor assembly junction block and fit light tackle.

(49) Fit fork end anchors of short link over bottom panel pins at 22p0.

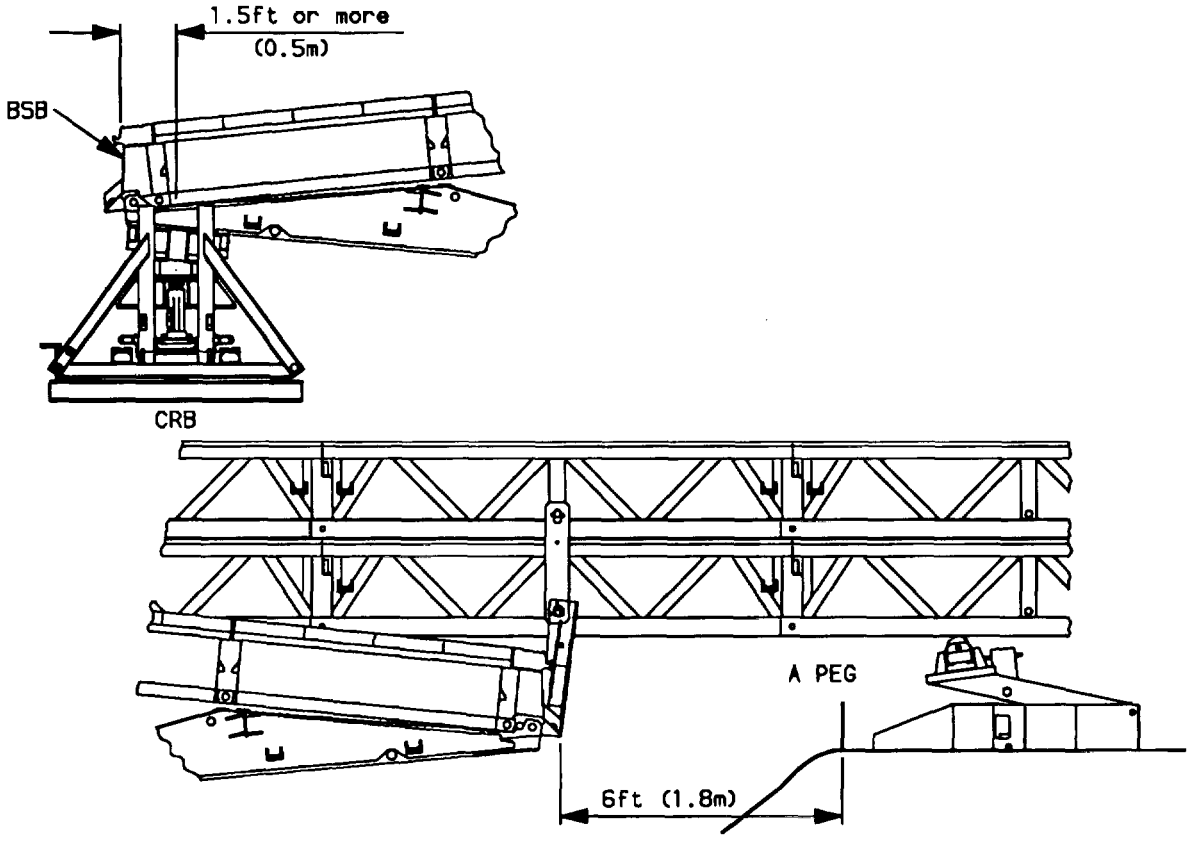
(50) Launch to Dp2 (over CRB) removing launching noses observing the 5 lt (1.5 m) minimum overhang. Leave the last three nose sections in place. These sections will be removed after the far bank end of bridge has been lowered to the ground.

NOTE

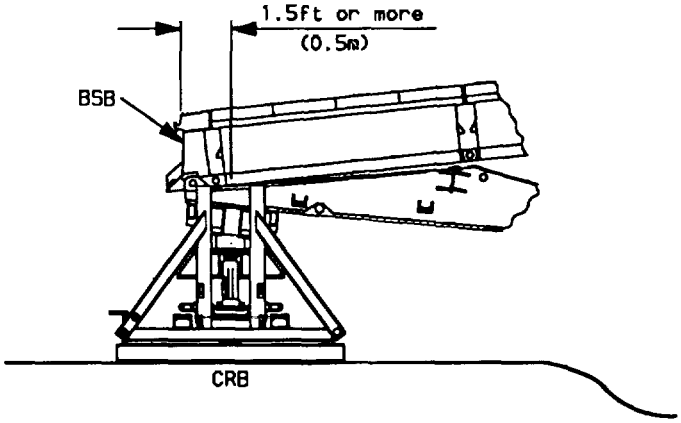
It may be necessary to lift or lower the anchor junction block and the end of the link chain to allow the fork end anchors of the long link to be fitted to the bottom panel pin at Dp0.

(51) Fit fork end anchors of long link over bottom panel pins at Dp0.

(52) Continue launch until either far bankseat beam approaches within 6 ft (1.8 m) of A peg or the near bank end of bridge is within 1.5 ft (0.5 m) (2 panel points) of center of capsill roller beam rollers. Stop launch when one of the above is met.



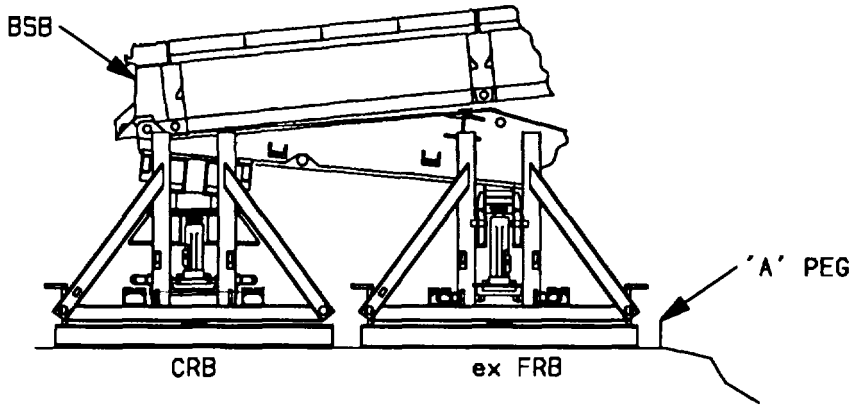
(53) Continue launch until near bank bankseat beam is 1.5 ft (0.5m) (2 panel points) from the center of the capsill roller beam roller



NOTE

The front roller beam will now be used to jack the bridge to enable the capsill roller beam to be removed. The front roller beam will now be called ex FRB.

(54) Install ex FRB under bridge between capsill roller beam and A peg, with its baseplates next to capsill roller bridge baseplates. Ensure ex FRB is centered under bridge and at 900 to centerline.



(55) Raise ex FRB to its maximum safe height.

(56) Lower capsill roller beam until the bridge rests on rollers of ex FRB.

(57) Ensure ex FRB rollers are unlocked (vehicle is holding bridge).

(58) Remove capsill roller beam from under the end of bridge and disassemble.

(59) Reposition the landing roller pedestal.

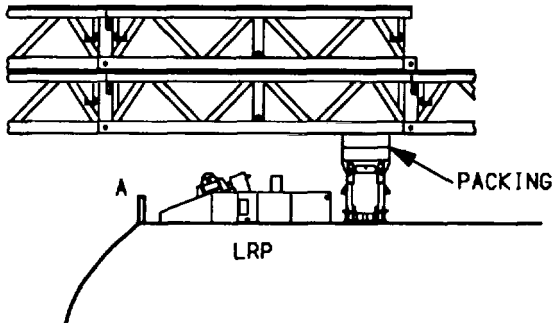
NOTE

If two landing roller pedestals are not available, use procedures (a) thru (f). If two are available, use procedures (g) thru (i).

(a) Place one launching nose heavy section under nose. Nose section is placed perpendicular to the launching nose and against base at the rear of the landing roller pedestal.

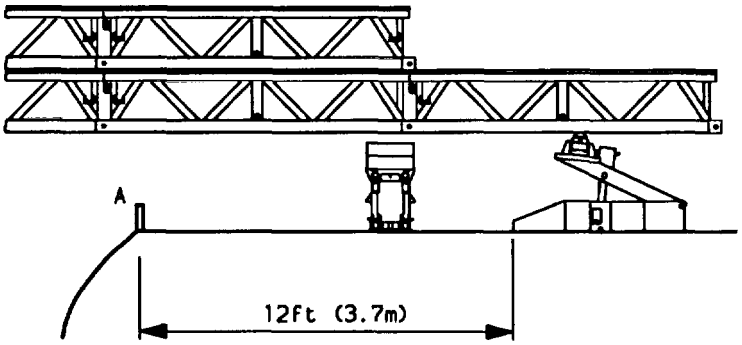
(b) Place two pieces of packing on top of nose section to protect the edges of nose section.

(c) Operate hydraulic jack to lower the launching nose onto the packing and nose section.



(d) Remove the landing roller pedestal and relocate it under the launching nose so the base of it is 12 ft (3.7 m) from the A peg.

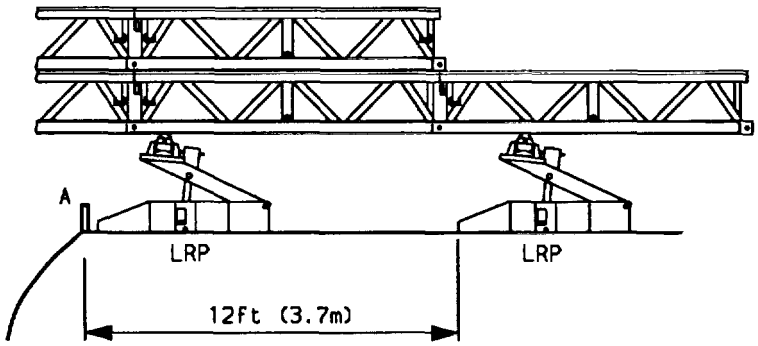
(e) Operate hydraulic jack to it's maximum height.



(f) Remove packing and nose section from under launching nose.

(g) Position spare landing roller pedestal under launching nose 12 ft (3.7 m) from A peg.

(h) Operate hydraulic jack until this landing roller pedestal is fully raised and remove first landing roller pedestal from under nose.

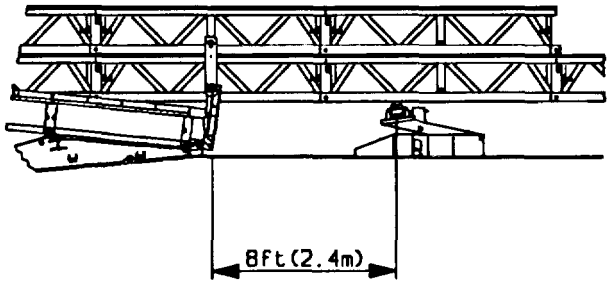


(i) Operate hydraulic jack in first landing roller pedestal to lower it complete. Remove from site.

(60) Continue launch until far bank bankseat beam is over far bank, and the required bearing is reached. [For 22 bay minimum bearing is 5.25 ft (1.6 m)].

(61) Lock rollers on ex FRB.

(62) Lower far bank end of bridge by operating jack in landing roller pedestal. Reposition landing roller pedestal so the center of roller is 8 ft (2.4 m) from nose roller on bankseat beam. Raise landing roller pedestal until roller touches bottom of launching nose.



(63) Disconnect vehicle from bridge.

(64) Remove launching nose (para. 4-13b.) and nose roller (reverse of para. 4-10).

(65) Remove launching nose cross girder and posts (para. 4-11). Far bank crew returns to near bank.

(66) Reposition counterweight deck units to their final position and remove the curbs from the bankseat beam to enable jacking bracket to be connected if davits are to be used.

(67) Lower near bank end of bridge using jacks (para. 4-20), davits (para. 4-21) or crane (para. 4-22).

(68) Lower link chain [para. 4-16c step (4)] on both sides of bridge and tension link chains (para. 4-16e.).

(69) If approach surface is to be improved, do so at this time.

(70) Hook seven long ramp units to near bankseat beam. Ensure anti-lift lugs are engaged (para. 4-24).

(71) Lay decking, starting on near bank end of bridge (para. 4-25).

(72) If exit surface is to be improved, do so at this time.

(73) Hook seven long ramp units to far bankseat beam. Ensure anti-lift lugs are engaged.

(74) Fit curbs, starting on near bank end of bridge (para. 4-26).

(75) Put bridge guide markers in place (para. 4-26).

(76) After bridge has passed inspection, put bridge classification signs in place.

(77) Make sure all erection equipment is away from roadway. The bridge is now ready for use.

7-2. DISASSEMBLY - 2E + 22 BAY LINK REINFORCED

a. Preparation for Disassembly

(1) If pumps, hoses and water are available, the bridge, erection and link components should be washed before loading them on to pallets.

(2) If washing cannot be done, the components are loaded directly onto pallets.

b. Disassembly

NOTE

Throughout bridge disassembly the NCOIC must monitor the height and level of the roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Remove bridge classification signs, bridge guide markers and curbs (reverse of para. 4-26). Retain six curbs on the near bank end of bridge as part of counterweight [see step (4)].

(2) Remove far bank ramp units, removing center ramp first (reverse of para. 4-24).

(3) Operate cable pullers on post tensioners to release tension in link chain, then use light tackle to raise link chain [reverse of para. 4-16e. and d. step (4)].

(4) Remove deck units (reverse of para. 4-25) starting on the far bank end of bridge as follows:

(a) Leave a deck unit in the third recess of bays 1, 7, 11, 17, and 21.

(b) Leave both bays of near end of bridge fully decked (eight deck units).

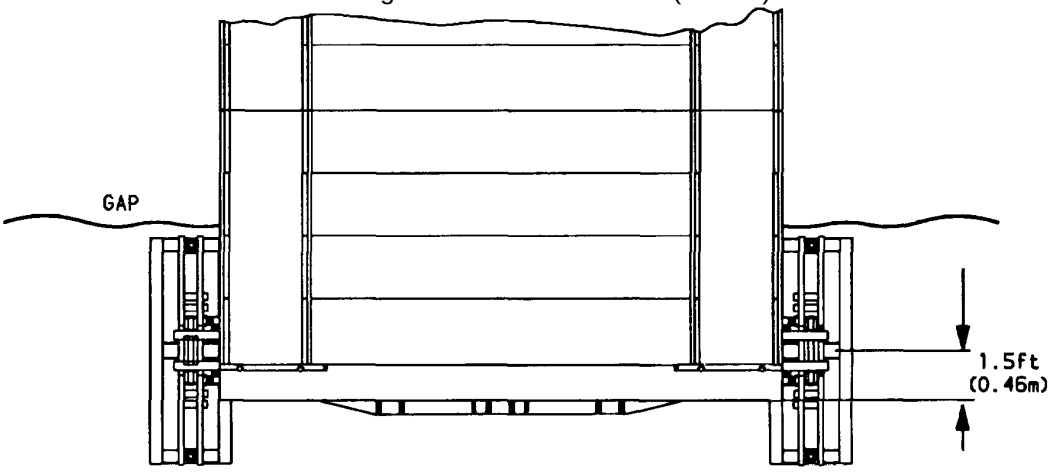
(c) Leave thirty two deck units (this makes a total of forty) and six curbs in the bridge to be used as counterweight after step (10).

(5) Add launching nose cross girder and posts (para. 4-11b) on far bank junction panel.

(6) Remove near bank ramp units, removing center ramp first (reverse of para. 4-24).

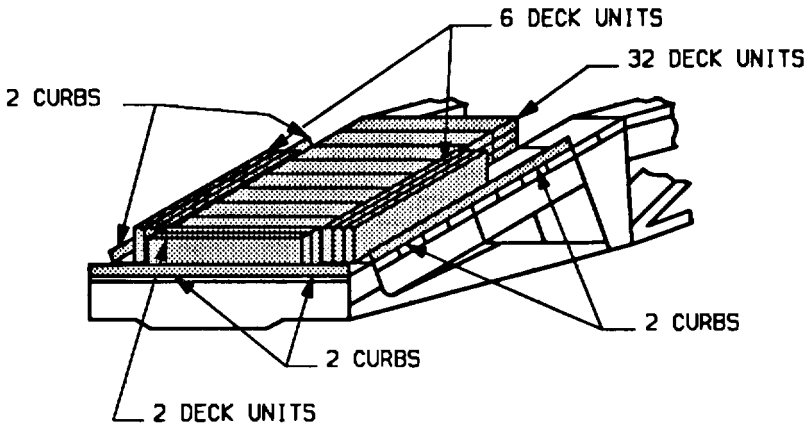
(7) Raise near bank end of bridge using jacks, davits or crane, high enough to install a roller beam (ex FRB).

(8) Install ex FRB centered on bridge and a minimum 1.5 ft (0.46 m) from outside of bankseat beam.

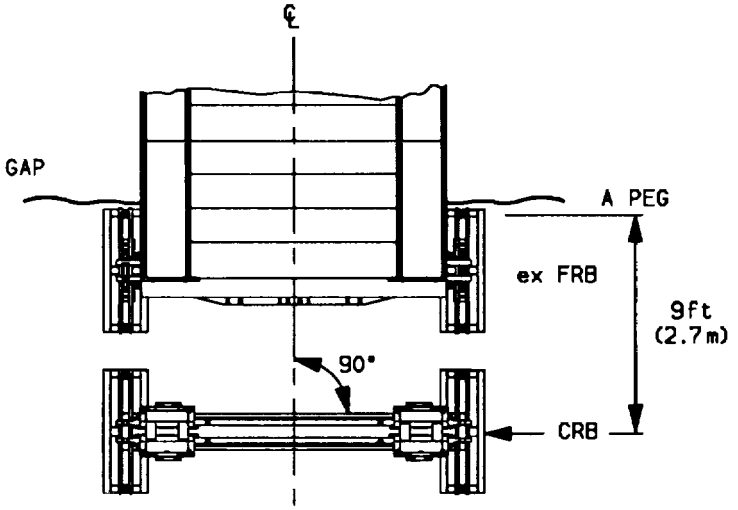


(9) Lower bridge evenly onto ex FRB. Ensure rollers are locked.

(10) Remove either jacks, crane, or davits with jacking brackets and pullers. If vehicle was used, move backward about 25 ft (7.6 m) from end of bridge. Transfer thirty two deck units and six curbs to near bank end of bridge to complete counterweight.



(11) Assemble and position capsill roller beam (CRB) over centerline at 9ft. (2.7m) from A' peg. Capsill roller beam should be set at a height that will permit end of bridge to pass over it during next delaunch. Ensure center of capsill roller beam is over centerline of bridge, and ensure that the capsill roller beam is at 90° to centerline of bridge.



CAUTION

The following cautions must be observed each time the bridge is delaunched. Do not allow the vehicle to drift right or left of centerline. Keep vehicle straight and in line with bridge. Movement of bridge to right or left can cause damage to roller beams.

(12) Connect vehicle to bridge with a long push bar (para. 4-18c).

(13) Fit launching nose roller to far bank bankseat beam (para. 4-10).

(14) Assemble launching nose and position landing roller pedestal 12 ft (3.7 m) from A peg (para. 4-14b.).

NOTE

The following procedure assumes only the double story nose sections and one single story nose section (6N1) have been added. The remaining will be added during disassembly.

NOTE

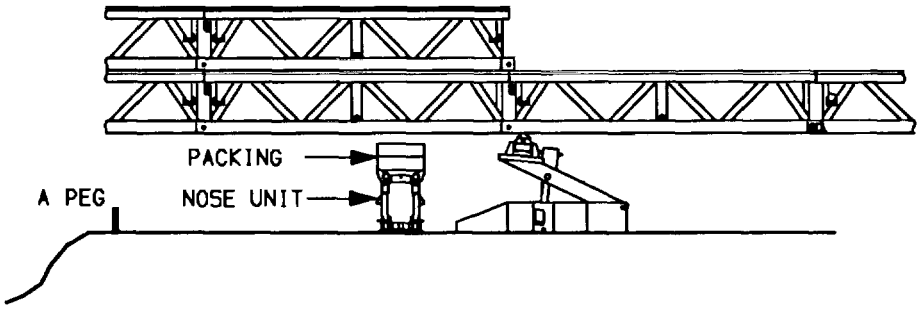
Vehicle is holding bridge and roller catches on ex FRB are locked.

(15) Using landing roller pedestal, raise far bank end of bridge off ground until jack is fully extended.

(16) Unlock rollers and delaunch bridge until far bankseat beam is 6 ft (1.8 m) from A peg. At this time near bankseat beam should be a minimum of 1.5 ft (0.5 m) from center of capsill roller beam. Do not disconnect vehicle.

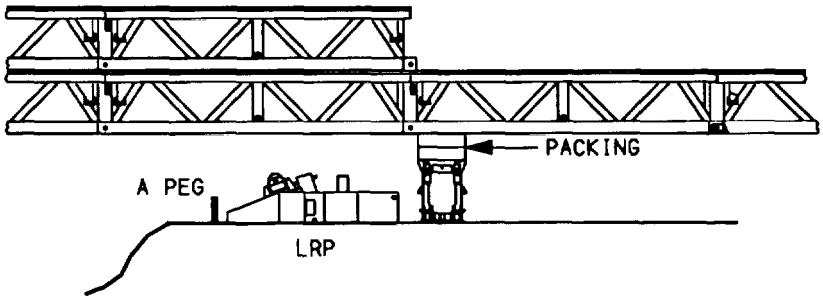
(17) Reposition the landing roller pedestal under the launching nose. For two landing roller pedestal method perform steps (f) thru (g). For method using nose section, perform (a) thru (e).

(a) Place two pieces of packing (3 in x 8 in x 36 in) on top of nose section to protect the edges of nose sections. If distance between bottom of launching nose and top of packing is greater than 1 ft (0.3 m), additional packing must be used.



(b) Operate hydraulic jack to lower the launching nose onto the packing and nose section.

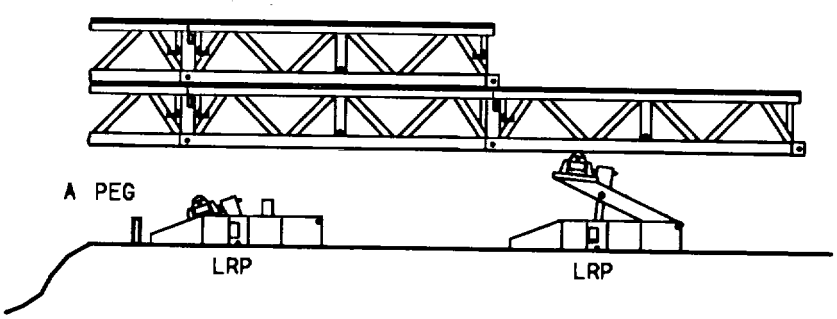
(c) Move the landing roller pedestal forward until it is against the original A peg. Align the landing roller pedestal with the launching nose.



(d) Operate hydraulic jack to lift the launching nose off of the packing and nose section.

(e) Remove packing and nose section from under launching nose.

(f) Position second landing roller pedestal under launching nose with base against original A peg.



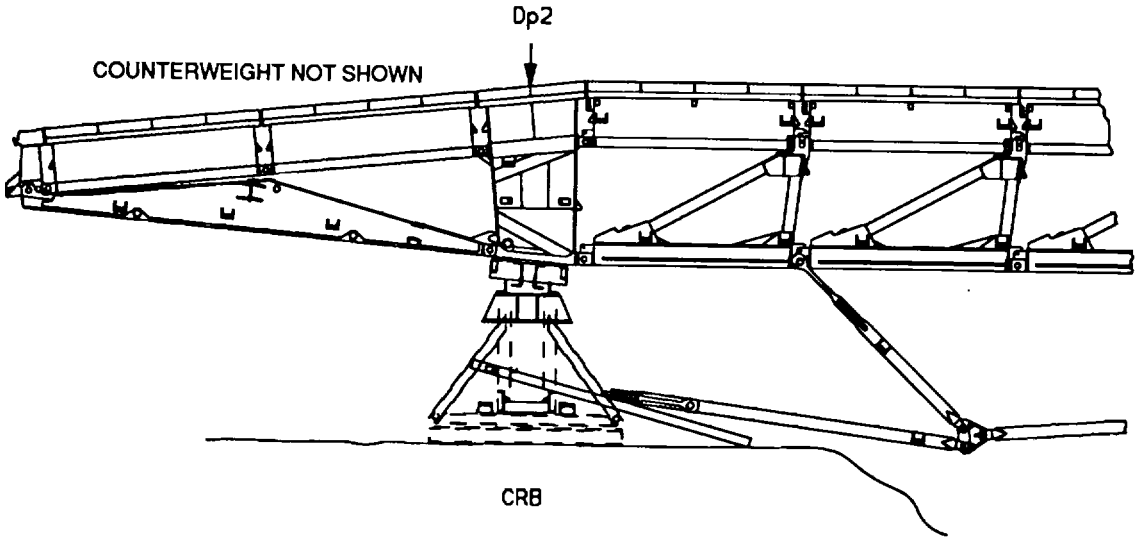
(g) Operate jack in landing roller pedestal to raise launching nose off of first landing roller pedestal. Lower first landing roller pedestal and remove from under launching nose.

(18) Raise capsill roller beam until weight of bridge is on capsill roller beam and off ex FRB. Continue raising to maximum height 4.1 ft (1.3 m) and level capsill roller beam at maximum height. When raising capsill roller beam, if jacks have to be restaged, jack seat must be placed on capsill pin in holes 1, 2 or 3. Do not put jack seat on pin in holes 4, 5 or 6.

(19) Remove ex FRB from under bridge.

(20) Delaunch bridge until Dp2 is over capsill roller beam.

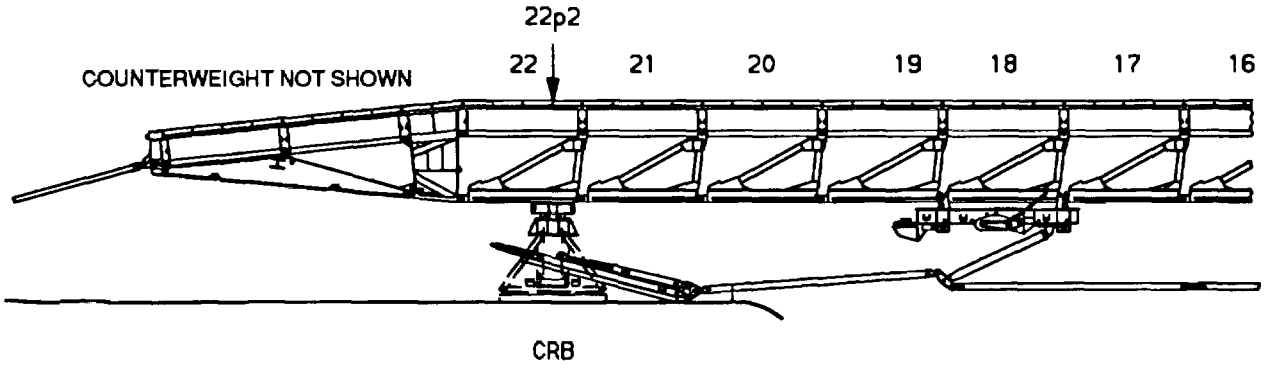
(21) Place timber packing (3 in x 8 in x 84 in) over capsill roller beam cross girder and remove long link fork end anchors from bottom panel pin at Dp0. Lower long link onto packing and place fork end anchors in their stowed position but do not secure with bracing pins until step (23) to prevent them fouling on CRB.



(22) If not previously done so at step (14), add launching nose heavy section 5N1.

(23) Delaunch bridge to 22p2 (over CRB). Lock rollers. Secure anchor assembly long link fork end anchors in their stowed position with bracing pin and retainer clip.

(24) Remove short link fork end anchors from bottom panel at 22p0.



(25) Assemble and position front roller beam (FRB) 30 ft (9.2 m) from capsill roller beam. Ensure center of front roller beam is over centerline of bridge and front roller beam is at 90° to centerline of bridge. Set the height of the FRB lower than the RRB [see step (36)].

(26) Add 4N1.

(27) Disconnect long link from anchor assembly and remove anchor assembly from under bridge.

CAUTION

It may be necessary to pull up on light tackle to clear the anchor assembly connecting block over the near bank.

(28) Delaunch bridge to 19p5.

(29) Add 3N1.

(30) Remove long link from post tensioning assembly link connecting block.

(31) Remove guard rope from footwalk posts, footwalk posts, footwalk and footwalk bearers.

(32) Disconnect long link from post tensioning assembly link connecting block.

(33) Pin the sliding block using pin previously placed in the well of bottom panel 18, then lift and move post until link connecting block can be pinned to frame of the assembly.

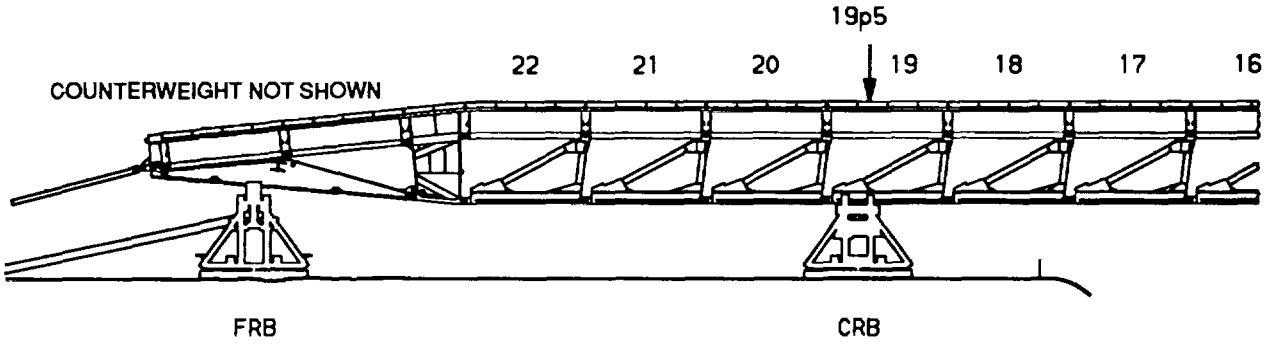
(34) Remove retainer clips from upper jaws of post tensioning assembly, lift assembly and open upper jaws. Lower assembly to the ground and remove from under bridge.

NOTE

Opening of upper jaws may require one person on each side of girder above tensioning assembly pushing against jaws with bootheel or otherwise use a lever between bottom panel and post tensioner.

(35) Assemble and position rear roller beam (RRB) 15 ft (4.6 m) from front roller beam. Ensure center of rear roller beam is over centerline of bridge and roller beam is at 900 to centerline of bridge. Use longitudinal girder to position RRB, then disconnect girders from RRB and place on the ground.

(36) Level roller beams and ensure rear roller beam is set higher than front roller beam.



(37) Remove light tackle from 19pl.

(38) During delaunch remove light tackle and long links. Feed long links under CRB cross girder.

(39) Add 2N1 and 1N1 to complete nose.

(40) Remove light tackle.

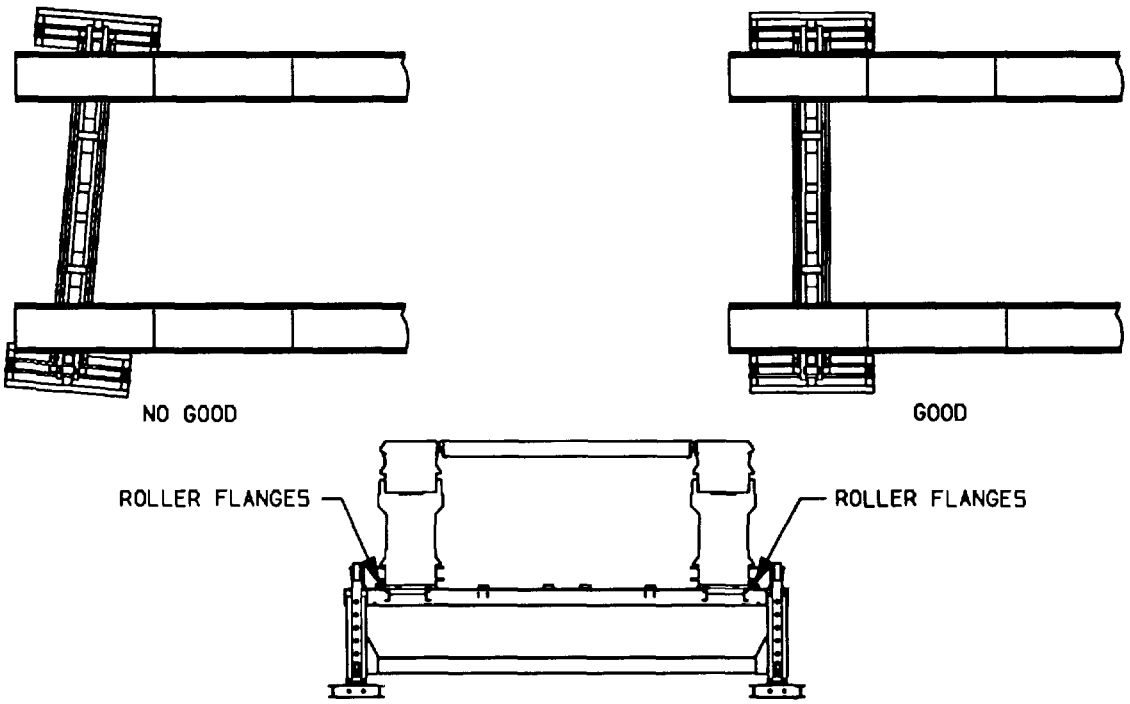
(41) Delaunch bridge to 15p0 (over CRB). During the delaunch remove light tackle, long links and add launching nose sections if not already fitted.

(42) Remove thirty seven deck units and six curbs counterweight from bridge as follows [leave 3 deck units as counterweight until step (48)]. Position a flat bed vehicle close to the end of bridge and use personnel standing on vehicle to transfer the counterweight from the bridge to personnel on the ground.

(43) Delaunch bridge to 10p0 (over CRB). During delaunch remove light tackle, links and anti-flutter tackle. As bridge approaches 10p0 position personnel around end of bridge to control bridge onto rear roller beam.

NOTE

The center of gravity of bridge Is over the capsill roller beam. it is at this point that any minor adjustments in the front and rear roller beam placement must be made. Ensure that bridge will come to rest on rear roller beam correctly. The bridge should rest between flanges of rollers, not on top of them.



(44) Hold rear of bridge down on rear roller beam.

(45) Lower jack in landing roller pedestal. Remove landing roller pedestal from under launching nose and remove jack.

(46) Recover landing roller pedestal.

(47) Boom bridge to 15p4 (over RRB) removing light tackle and long links during boom. Lock rollers and disconnect push bar.

(48) Remove three deck units counterweight (3D) as described in step (42).

(49) Remove end of bridge (reverse of para. 4-9b.).

NOTE

Throughout the build the bridge Is delaunched using a vehicle, push bar and push bar cross girder (para. 4-18) which must be disconnected before further bays are added. To simplify the following procedures these drills are described "connect push bar" and "disconnect push bar."

(50) Connect push bar cross girder, push bar and vehicle to bridge. Unlock rollers and boom bridge to 13p7 over rear roller beam. Lock rollers.

(51) Remove guard rope, footwalk posts, footwalk and footwalk bearers

(52) Remove long link from post tensioning assembly.

(53) Remove post tensioning assembly (reverse of para. 4-16b.).

(54) Unlock rollers. Boom bridge to 13p0 (over RRB). Lock rollers and disconnect push bar.

(55) Remove light tackle from link connected to anchor assembly.

(56) Remove bays 22, 21, 20, 19 and 18.

(57) Connect push bar. Unlock rollers and boom to 11p0 (over RRB). Do not lock rollers, do not disconnect vehicle.

(58) Remove long link.

(59) Remove fork end anchors of anchor assembly short link from bottom panel at 2p0.

CAUTION

Place packing (3 In x 8 In x 84 In) on ground so that the anchor assembly runs on the packing during booming.

(60) Boom to 10p0 over rear roller beam. Lock rollers and disconnect push bar.

(61) Remove fork end anchors of anchor assembly long link from bottom panel at 1p0.

(62) Remove deck unit from bay 17 and remove bays 17, 16, 15 and 14.

(63) Connect push bar. Unlock rollers and boom the bridge as described below to 4p5 over rear roller beam. During this boom the end of bridge will leave CRB.

(a) Boom bridge until bankseat beam is 1 ft (0.3 m) gap side of capsill roller beam. Stop boom but do not lock rollers, vehicle is holding bridge.

(b) Raise FRB into contact with the bridge and at the same time lower the CRB so that the weight of the bridge is gradually transferred from the CRB to the FRB. Careful transfer of weight from CRB to FRB should achieve the correct working height at the end of bridge.

(c) Continue boom to 4p5 (over RRB). Lock rollers and disconnect push bar.

(d) If proper working height was not achieved at (b), adjust FRB and RRB to accommodate easy disassembly. Level roller beams.

(64) Disassemble and remove capsill roller beam from site.

(65) Remove bay 13, deck unit from bay 11, bay 12 and bay 11.

(66) Connect push bar. Unlock rollers and boom to 2p7 over rear roller beam. Lock rollers and disconnect push bar.

(67) Remove bays 10, 9 and 8.

(68) Connect push bar. Unlock rollers and boom to 1 p2 over rear roller beam. Lock rollers and disconnect push bar.

(69) Remove deck unit from bay 7 and remove bays 7 and 6.

(70) Remove double story nose 3N2, 2N2 and 1N2.

(71) Remove bays 5 and 4.

(72) Remove 6N1, 5N1, 4N1, 3N1, 2N1, landing roller pedestal and 1 N1.

(73) Remove bay 3.

(74) Remove launching nose cross girder and posts (para. 4-11).

(75) Remove nose roller from bankseat beam (para. 4-10).

(76) Remove bay 2.

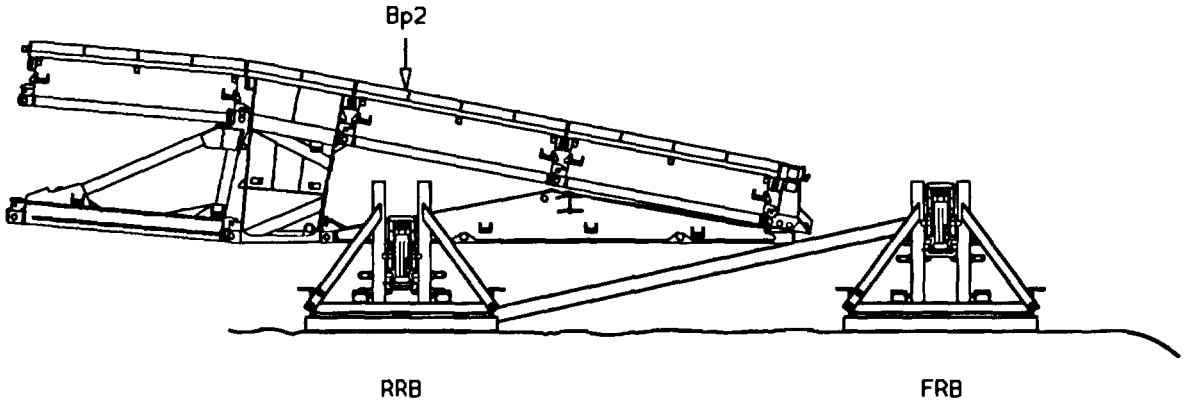
(77) Position 16 personnel (right and left side crews) around end of bridge.

(78) Unlock roller beam rollers.

CAUTION

It is necessary to lift the end of bridge off the front roller beam rollers onto the longitudinal girders. Do not allow bridge to drop onto longitudinal girders.

(79) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(80) Lock rollers. Disassemble bay 1 and end of bridge (reverse of para. 4-8).

(81) Disassemble roller beams.

(82) Clear site.

7-3. DISASSEMBLY ON ORIGINAL FAR BANK

a. General

This paragraph provides only the additional or modified steps needed to disassemble a link reinforced MGB on the original far bank. The operator must be familiar with, or refer to, the General Drills (Chapter 4) and Disassemble 2E + 22 bay Link Reinforced Near Bank (para. 7-2).

NOTE

The original far bank becomes the new near bank, the original near bank becomes the new far bank. Also the bays of the bridge must be renumbered from the new far bank. Using a 2E + 22 Bay as an example, what was bay 22 is now bay 1, and what was bay 1 Is now bay 22.

All reference to near or far bank from this point will be referring to the new near bank and the new far bank.

Move all launching nose components to the far bank, and all the roller beam components to the near bank. All pallets must be moved to near bank.

When removing panels refer to paragraph 4-27a for removal of junction panel, and 4-27b and c for removal of top and bottom panels.

b. Skidding

If a bridge has been emplaced with minimum bearing on the original far bank (now near bank), it will be necessary to skid the bridge to get 4.5 ft (1.4 m) over the bank so that ex FRB can be put under it safely. This will only apply to bridges 13 to 21 bays long. A 22 bay link reinforced bridge will already have 5.3 ft (1.6 m) minimum bearing on the new near bank.

Therefore, for 13 to 21 bay link reinforced bridges, skid the bridge as described in step a.(2) paragraph 63.

c. Disassembly, 22 Bay Link Reinforced

NOTE

Throughout bridge disassembly the NCOIC must monitor the height and level of the roller beams. The height must be set to achieve an acceptable working height. Roller beams must be level so that components connect/disconnect properly.

(1) Perform steps a.(1) and (2) and b.(1) thru (55) in paragraph 7-2.

(2) Remove bays 22, 21, 20 and 19. Remove bottom panel 18.

CAUTION

For all boom/delaunches with the vehicle, before connecting the push bar cross girder and push bar, ensure the last bottom panel top jaws are still located round the panel pin.

(3) Boom bridge to 1p0 (over RRB). Do not lock rollers, do not disconnect vehicle.

(4) Remove long link.

(5) Remove fork end anchors of anchor assembly short link from bottom panel at 2p0.

CAUTION

Place packing (3 In x 8 In x 84 In) on ground so that the anchor assembly runs on the packing during booming.

(6) Boom to 10p0 over rear roller beam. Lock rollers and disconnect push bar.

(7) Remove fork end anchors of anchor assembly long link from bottom panel at 1p0.

(8) Remove deck unit from bay 17 and remove top panel 18, bays 17,16, 15,14 and bottom panel 13.

(9) Boom the bridge as described below to 4p3 over rear roller beam. During this boom the end of bridge will leave CRB.

(a) Boom bridge until bankseat beam is 1 ft (0.3 m) gap side of capsill roller beam. Stop boom but do not lock rollers, vehicle is holding bridge.
(b) Raise FRB into contact with the bridge and at the same time lower the CRB so that the weight of the bridge is gradually transferred from the CRB to the FRB. Careful transfer of weight from CRB to FRB should achieve the correct working height at the end of bridge.
(c) Continue boom to 4p3 (over RRB). Lock rollers and disconnect push bar.
(d) If proper working height was not achieved at (b), adjust FRB and RRB to accommodate easy disassembly. Level roller beams.

(10) Disassemble and remove capsill roller beam from site.

(11) Remove top panel 13, deck unit from bay 11, bay 12 and bottom panel 11.

(12) Boom to 3p0 over rear roller beam. Lock rollers and disconnect push bar.

(13) Remove top panel 11, bay 10 and bottom panel 9.

(14) Boom to 1p7 over rear roller beam. Lock rollers and disconnect push bar.

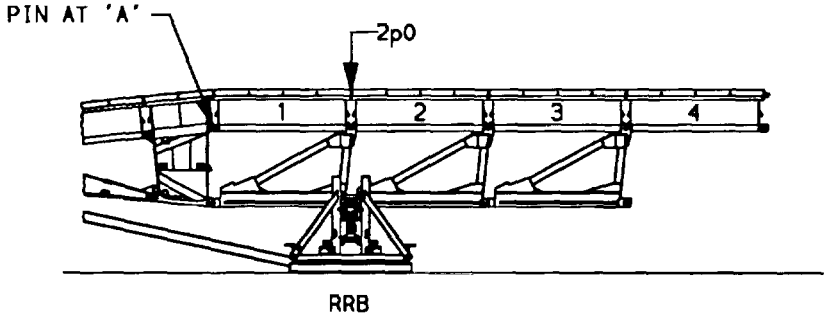
(15) Remove deck unit from bay 7 and remove top panel 9, bay 8 and bottom panel 7.

(16) Remove double story nose 3N2, 2N2 and 1N2.

(17) Remove top panel 7, bays 6, 5 and bottom panel 4.

(18) Remove remainder of launching nose.

(19) Boom to 2p0 and remove pin at A.

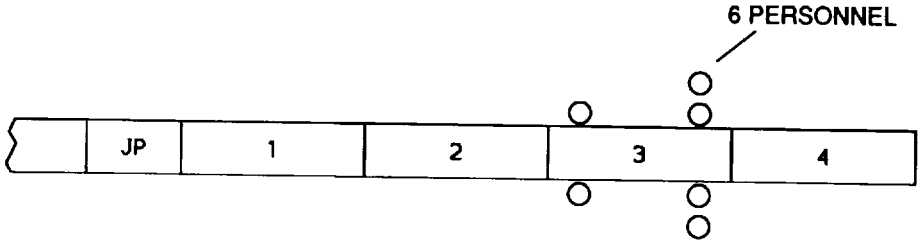


NOTE

The panel pin in the upper pin jaws of the junction panel and last top panel is called the pin at "A." This panel pin must be removed before the top panel of bay 4 can be removed. The removal of the pin at "A" serves the same purpose as unlocking the bottom panel shoot bolt.

(20) To remove the pin at "A."

(a) Position six personnel around the rearmost bottom panel.



(b) Remove the pin at "A" as the six personnel lift the bottom panel.

(21) Boom bridge to panel point lp4.

(22) Remove remaining bays of bridge until bay 2 bottom panel is removed.

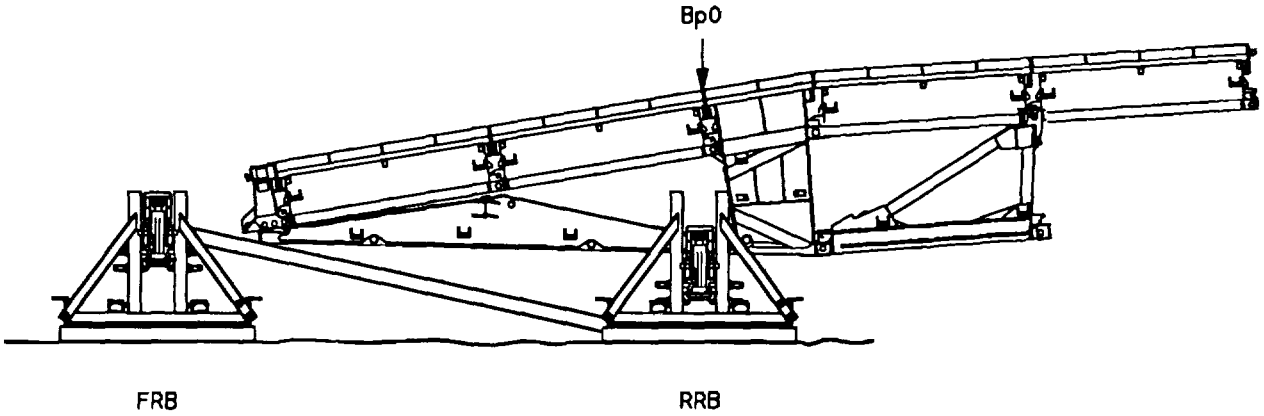
(23) Position 16 personnel (right and left side crews) around end of bridge.

(24) Unlock roller beam rollers.

CAUTION

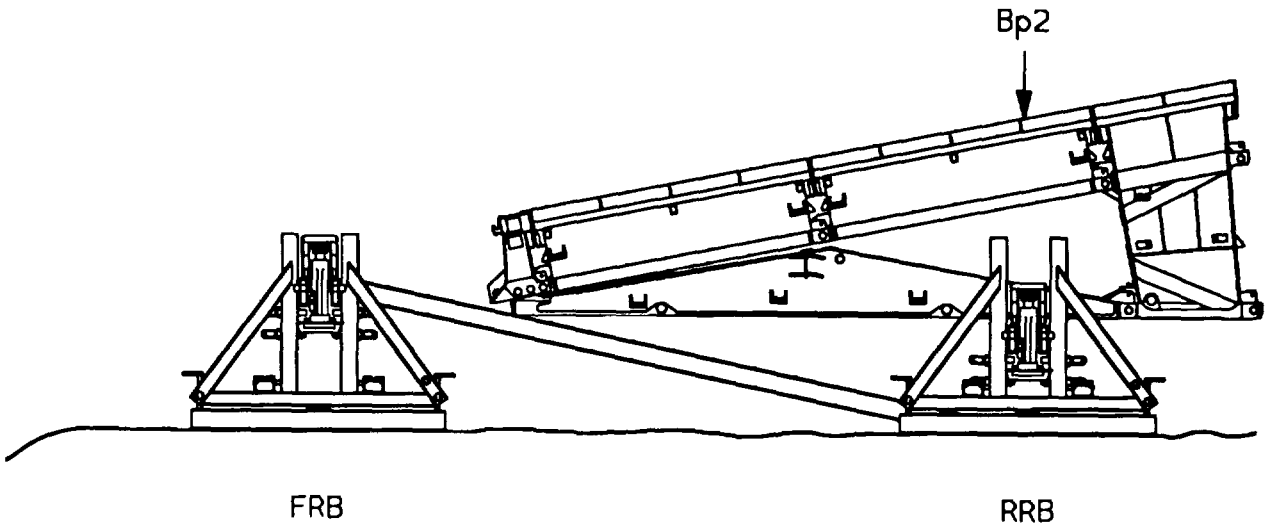
It is necessary to lift the end of bridge off the front roller beam rollers and onto the longitudinal girders. Do not allow bridge to drop onto longitudinal girders.

(25) All 16 personnel lift bridge back to Bp0 (over RRB)



(26) Remove top panel 2 and bay 1

(27) All 16 personnel lift and pull bridge back until bankseat beam is at second cross member of longitudinal girder (Bp2 over RRB).



(28) Lock rollers. Disassemble end of bridge.

(29) Disassemble roller beams and clear site.

Section III. COUNTERWEIGHTS - LINK REINFORCED BRIDGES

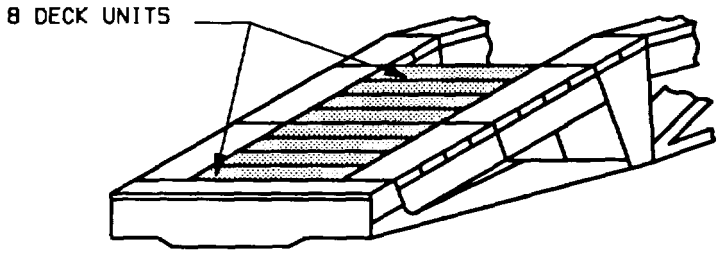
It is necessary to use counterweights during assembly/de-launch of 2E + 19 thru 2E + 22 bay link reinforced bridges on normal sites. The following paragraphs describe the counterweights, but do not describe when they are added or removed. This depends on the size of bridge and type of site.

NOTE

It is important to always refer to the build and boom or de-launch table for the bridge being built or delaunched, to determine when the counterwelghts are added or removed.

7-4. 2E + 19 BAY - NORMAL SITE

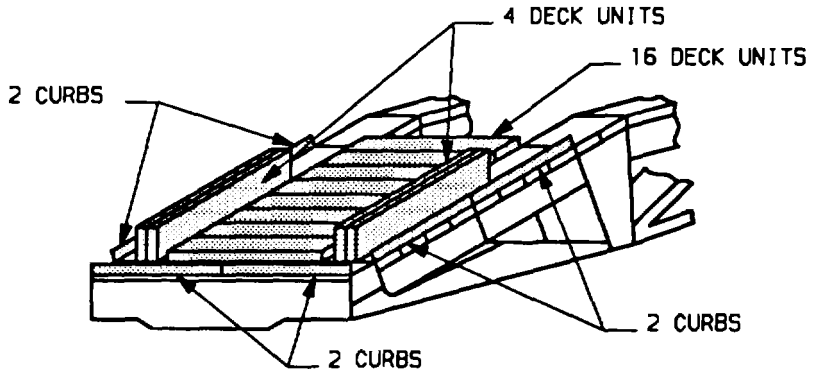
On 2E + 19 bay link reinforced bridges, eight deck units are placed in their final position on the end of bridge as a counterweight.



7-5. 2E +20 BAY - NORMAL SITE

On 2E + 20 bay link reinforced bridges, twenty deck units and six curbs are placed on the rear end of bridge as counterweight.

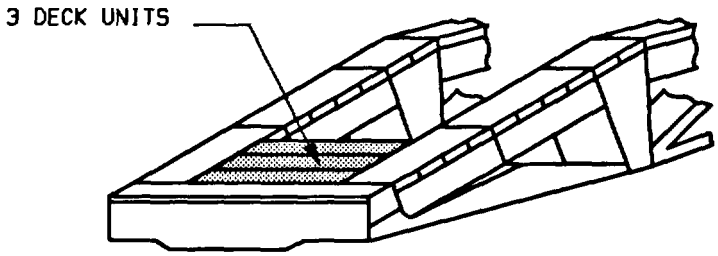
Eight deck units are placed in their final position on the end of bridge. Two curbs are placed on the bankseat beam and four curbs on the top panels to retain the counterweight. The additional twelve deck units are placed on decking, eight laid flat and four on edge leaning toward deck units as shown.



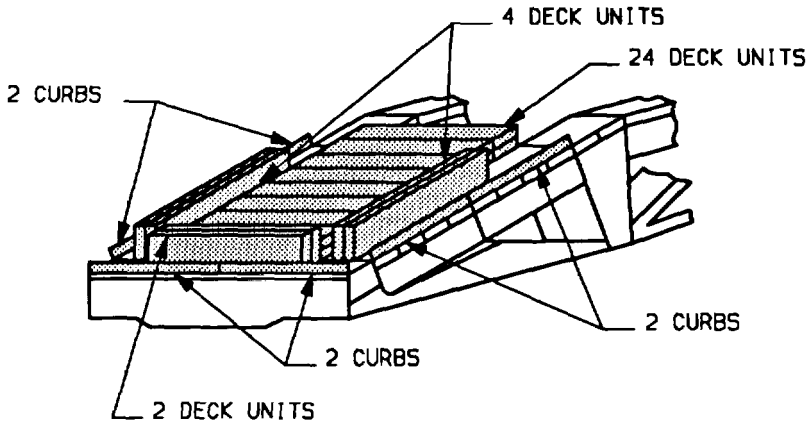
7-6. 2E + 21 BAY - NORMAL SITE

On 2E + 21 bay link reinforced bridges, thirty deck units and six curbs are placed on the rear end of bridge as counterweight. The counterweight is added in two stages.

The first stage uses three deck units placed in their final position.



The second stage uses twenty seven deck units and six curbs. Five deck units are placed in their final position on the end of bridge next to the three placed at the first stage. Two curbs are placed on the bankseat beam and four curbs on the top panels to retain the counterweight. The additional twenty two deck units are placed on decking, sixteen laid flat and six on their edge leaning toward deck units as shown.

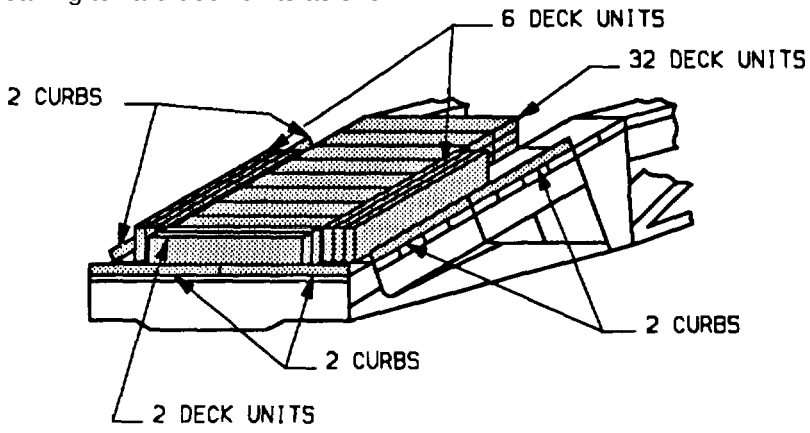


7-7. 2E + 22 BAY - NORMAL SITE

On 2E + 22 bay link reinforced bridges, forty deck units and six curbs are placed on the rear end of bridge as counterweight. The counterweight is added in two stages.

The first stage uses three deck units (para. 7-6).

The second stage uses thirty seven deck units and six curbs. Five deck units are placed in their final position on the end of bridge next to the three placed at the first stage. Two curbs are placed on the bankseat beam and four curbs on the top panels to retain the counterweights. The additional thirty two deck units are placed on decking, twenty four laid flat and eight on their edge leaning toward deck units as shown.



Section IV. ANCHORAGE-LINK REINFORCED BRIDGES

Anchorage for link reinforced bridges uses the same procedures as double story bridges, which are described in Chapter 6, Section VI.

CHAPTER 8

OPERATOR MAINTENANCE

		Page
Section I.	LUBRICATION	8-2
8-1	OPERATOR LUBRICATION	8-2
Section II.	TROUBLESHOOTING	8-2
8-2	OPERATOR TROUBLESHOOTING PROCEDURES	8-2
Section III.	MAINTENANCE PROCEDURES	8-7
8-3	OPERATOR MAINTENANCE PROCEDURES	8-7
8-4	BRIDGE MARKER GUIDE.	8-8
8-5	END TAPER PANEL, BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, BOTTOM PANEL, LAUNCHING NOSE HEAVY (Resilient Mount)	8-10
8-6	BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, LAUNCHING NOSE HEAVY (Shoot Bolt)	8-12
8-7	BOTTOM PANEL (Shoot Bolt)	8-14
8-8	ROLLER BEAM (Jack Hood, Roller Catch)	8-16
8-9	LAUNCHING NOSE CROSS GIRDER (Safety Catch)	8-18
8-10	LAUNCHING NOSE CROSS GIRDER (Pins and Chains)	8-20
8-11	HYDRAULIC JACK (15T)	8-22
8-12	HYDRAULIC JACK (20T)	8-24
8-13	JACK POST	8-26
8-14	ADJUSTABLE SUPPORT (Shoot Bolt)	8-28
8-15	ADJUSTABLE SUPPORT (Pins and Chains)	8-30
8-16	ADJUSTABLE SUPPORT (Leveling Screw)	8-32
8-17	FIXED SUPPORT (Pin and Trunnion)	8-34
8-18	JACKING BRACKET (Pins and Pulleys)	8-36
8-19	PULLER	8-38
8-20	ANTI-SKID COATING	8-40

Section I. LUBRICATION

8-1. OPERATOR LUBRICATION

a. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow dust, dirt or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.

b. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating components, wipe all points to be lubricated free of dirt and grease. Clean all lubrication points after lubricating, to prevent accumulation of foreign material.

c. Apply a light coat of oil MIL-L-7870A (2, Appendix D) to components to be kept in storage.

d. Store hydraulic jacks in an upright position.

e. Lubricate components as specified in Table 8-1.

TABLE 8-1. Operator Lubrication Table

COMPONENT	LUBRICANT	INTERVAL	REMARKS
Shoot bolt (Bottom Panel)	Grease, MIL-G10924	Every six months.	Apply light coat. Wipe off excess with clean dry cloth.
Pins, chains (Launching Nose Cross Girder and Adjustable Support)	Lubricating oil, MIL-L-7870A	Every six months. excess with clean dry cloth.	Apply light coat. Wipe off
Hydraulic jack (15T & 20T)	Lubricating oil, MIL-L-7870A	Before use.	Check oil level and fill. Check filler plug air vents. Check and clean ram wiper seal. Clean between quadrant and jack body.
		Every month.	Oil ram.
Leveling screws (Adjustable Support and Davits)	Grease, MIL-G10924	Every six months.	Apply light coat. Wipe off excess with clean dry cloth.

Section II. TROUBLESHOOTING

8-2. OPERATOR TROUBLESHOOTING PROCEDURES

a. Table 8-2 lists the common malfunctions which may be found during the operation or maintenance of MGB or its components. The tests/inspections and corrective action should be performed in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or it is not corrected by listed actions, notify the supervisor.

c. Be sure that Preventive Maintenance Checks and Services has been applied before troubleshooting (para 2-2).

d. The Symptom Index is to assist the operator in locating the troubleshooting procedures in Table 8-2.

SYMPTOM INDEX

END TAPER PANEL, BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, BOTTOM PANEL, AND HEAVY LAUNCHING NOSE

Will not connect ..... (1)

LONG OR SHORT RAMP

Lifts when traffic crosses bridge ..... (2)

SWAY BRACE

Will not connect ..... (3)

ROLLER BEAM/ROCKING ROLLER

Jack hoods will not move up to position ..... (4)

Rollers will not turn ..... (5)

HYDRAULIC JACK 15T & 20T

Will not raise, hold position or lower ..... (6)

Springs up or feels spongy ..... (7)

PULLER

Jerks when lowering load or will not operate ..... (8)

POST TENSIONER

Sliding block binds ..... (9)

TABLE 8-2. Operator Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
(1) COMPONENTS WILL NOT CONNECT (ETP, BSB, JP, TP, BP, LNH)
a. Ensure that roller beams are on same horizontal plane. Level roller beams or position beams on same plane.
WARNING **Do not insert fingers between components or into pin holes to check for or to remove obstructions. Serious injury may occur.**
b. Visually check for obstructions (dirt, rocks, ice) in pin jaws, shoot bolt housing or dowel sockets. Remove obstruction.
c. Check for burred or gouged areas on following components: dowels shoot bolts butting surfaces shoot bolt handle slot resilient mounts guide slots pin jaws Use file to remove burrs or edge of gouged areas.
d. Check for seized, bent or distorted resilient mount. Replace resilient mount.
e. Check for bent shoot bolt. Replace shoot bolt.
f. Plunger will not engage or lock shoot bolt (bottom panel only). Check for damaged plunger assembly.
If components will still not connect to other component, replace and report condition to Unit Maintenance.

(2) LONG OR SHORT RAMP LIFTS WHEN TRAFFIC CROSSES BRIDGE

a. Check ramp for correct installation.
Install ramp correctly.

b. Check for missing anti-lift lug on ramp or bankseat beam.
If lug is missing from ramp unit, replace ramp.
If lug is missing from bankseat beam, watch ramp to ensure that it does not come off during crossing of traffic.
After operation, replace ramp or bankseat beam and report condition to Unit Maintenance.

(3) SWAY BRACE WILL NOT CONNECT TO BANKSEAT BEAM, BOTTOM OR END TAPER PANEL

a. Ensure that roller beams are on same horizontal plane.
Level roller beams or position beams on same plane.

b. Check girder spacing.
Move girders side to side.

c. Inspect sway brace ends for burrs or gouged areas.
Use file to remove burrs or edge of gouged areas.

d. Inspect sway brace brackets for burrs or gouged areas.
Use file to remove burrs or edge of gouged areas.

If sway brace will still not connect, replace sway brace. Report condition to Unit Maintenance.

(4) ROLLER BEAM JACK HOODS WILL NOT MOVE TO UP POSITION

a. Ensure that roller catch is locked.
Lock roller catch.

b. Ensure that fixed pins are pushed out.
Push pins out.
If hood will still not move to up position, replace roller beam. Report condition to Unit Maintenance.

(5) ROLLERS IN ROLLER BEAM OR ROCKING ROLLER WILL NOT TURN

a. Ensure roller catch on roller beam is unlocked.
Unlock roller catch.

b. Inspect rollers for damage.
Replace roller beam. Report condition to Unit Maintenance.

(6) HYDRAULIC JACK 15T & 20T WILL NOT RAISE, HOLD POSITION OR LOWER

a. Check release valve is tight enough.

b. Check release valve is not stuck.
If valve is stuck, tap RH side of base at release valve position using hammer and block of wood.

c. Check oil level.
If low, top up with oil then remove air by:

20 T Jack:
Tightening filler cap/dipstick and pumping jack until ram is raised to full extent.
Unscrewing release valve screw 1 to 11/2 turns and pressing ram down as far as it will go, then tightening release valve screw.
Repeating until all air is expelled.
15 T Jack:
Remove air by depressing ball valve in filler cap/dipstick.

If air cannot be removed, replace jack and report condition to Unit Maintenance.

(7) HYDRAULIC JACK 15T & 20T SPRINGS UP AFTER BEING LOWERED OR FEELS SPONGY

a. Air in system.
Remove air by depressing ball valve in filler cap/dipstick.
If jack operation still spongy, remove air by repeating c. in (6) above.
If air cannot be removed, replace jack and report condition to Unit Maintenance.

(8) PULLER JERKS WHEN LOWERING LOAD, OR WILL NOT PULL IN OR LET OUT CABLE

a. Check for lack of lubrication and/or build up of earth, clay, etc.
Wash out puller and lubricate.

b. Check for shiny cable, indicating puller not gripping cable properly.
Report condition to Unit Maintenance
If still not operating correctly, replace puller and report condition to Unit Maintenance.

(9) POST TENSIONING SLIDING BLOCK BINDS OR WILL NOT SLIDE IN POST TENSIONING ASSEMBLY

a. Dirt and grease on sliding block and frame.
Clean frame and block.

b. Bent flanges in frame.
Replace post tensioning assembly. Report condition to Unit Maintenance.

c. Check for worn or damaged bearing strips on sliding block and post tensioner frame.
Replace post tensioning assembly. Report condition to Unit Maintenance.

Section III. MAINTENANCE PROCEDURES

8-3. OPERATOR MAINTENANCE PROCEDURES

a. The operator is responsible for inspection and repair by replacement of all major bridge, erection set and link reinforcement set components, i.e. all complete assemblies and some defective sub-assemblies.

(1) EXAMPLE 1. Operator inspects a top panel and finds a bent shoot bolt housing. Operator replaces the defective panel with a serviceable panel, and refers defective panel to Unit Maintenance for repair.

(2) EXAMPLE 2. Operator inspects a top panel and finds a bent shoot bolt handle. Operator repairs this component by removing the bent handle and replacing it with a new handle.

b. Maintenance that can be done at operator level is restricted to component sub-assemblies, as in EXAMPLE 2 above. An index of components and procedure numbers is given below.

PROCEDURE	COMPONENT	PAGE No.
8-4	BRIDGE MARKER GUIDE	8-8
8-5	END TAPER PANEL, BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, BOTTOM PANEL, LAUNCHING NOSE HEAVY (Resilient Mount)	8-10
8-6	BANKSEAT BEAM, JUNCTION PANEL TOP PANEL, LAUNCHING NOSE HEAVY (Shoot Bolt)	8-12
8-7	BOTTOM PANEL (Shoot Bolt)	8-14
8-8	ROLLER BEAM (Jack Hood, Roller Catch)	8-16
8-9	LAUNCHING NOSE CROSS GIRDER (Safety Catch)	8-18
8-10	LAUNCHING NOSE CROSS GIRDER (Pins and Chains)	8-20
8-11	HYDRAULIC JACK 15T	8-22
8-12	HYDRAULIC JACK 20T	8-24
8-13	JACK POST	8-26
8-14	ADJUSTABLE SUPPORT (Shoot Bolt)	8-28
8-15	ADJUSTABLE SUPPORT (Pins and Chains)	8-30
8-16	ADJUSTABLE SUPPORT (Leveling Screw)	8-32
8-17	FIXED SUPPORT (Pin and Trunnion)	8-34
8-18	JACKING BRACKET (Pins and Pulleys)	8-36
8-19	PULLER	8-38
8-20	ANTI-SKID COATING	8-40

8-4. BRIDGE MARKER GUIDE

This task covers:
a. Removal **b. Service/Repair** **c. Installation**

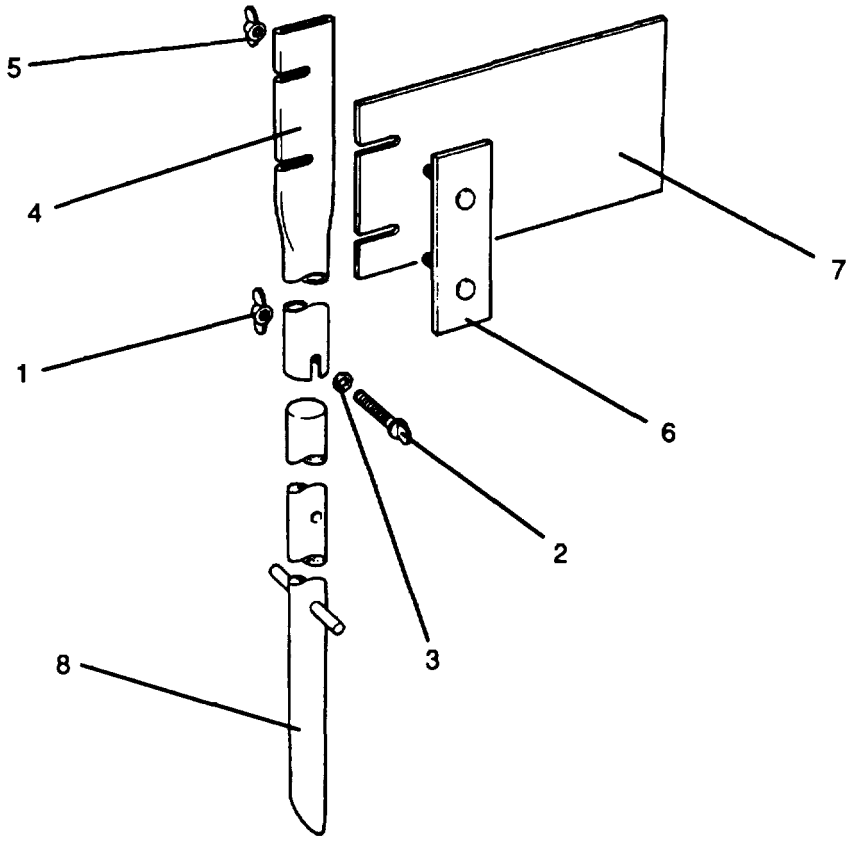
INITIAL SETUP:

Tools Required

6 inch pliers
1 lb ball peen hammer
8 inch screwdriver

Equipment Conditions

Guide assembly laid on flat surface.



a. Removal

(1) Unscrew wing nut (1) and remove wing screw (2) and washer (3).

(2) Remove pole top (4).

(3) Unscrew wing nut (5) from plate assembly (6) releasing flag assembly (7).

b. Service/Repair

(1) Replace components that are damaged or missing.

c. Installation

(1) Fit pole top (4) into pole bottom (8).

(2) Insert wing screw (2) and washer (3), and secure with wing nut (1).

(3) Fit flag assembly (7) over plate assembly (6) screw threads and secure in place by fitting and tightening wing nuts (5).

8-5. END TAPER PANEL, BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, BOTTOM PANEL, LAUNCHING NOSE HEAVY (Resilient Mount)

This task covers:
a. Removal **b. Service/Repair** **c. Installation**

INITIAL SETUP:

Tools Required

8 inch pliers
Drift pin
1 lb ball peen hammer
6 inch screwdriver

Materials Required

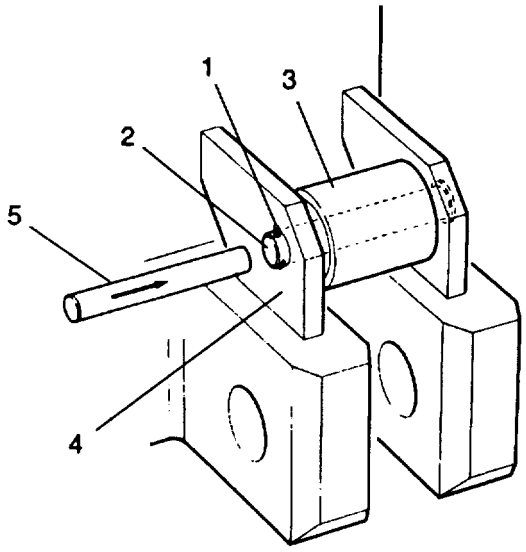
Clean cloths
Crocus cloth (25, Appendix D)

Equipment Conditions

Resilient mount in component.
Component in upright position on raised, flat surface.
No obstruction under bushing.

---

a. Removal



(1) Straighten prongs of cotter pin (1) with pliers and screwdriver

(2) Remove cotter pin (1) from pin (2) with pliers.

(3) Push on end of pin (2) until head of pin can be grasped, then pull pin from resilient mount (3) and housing (4).

(4) If pin cannot be removed by hand, hold drift pin (5) firmly against end of pin (2), then tap end of drift pin with hammer until pin is free.

(5) Remove pin (2) and resilient mount (3).

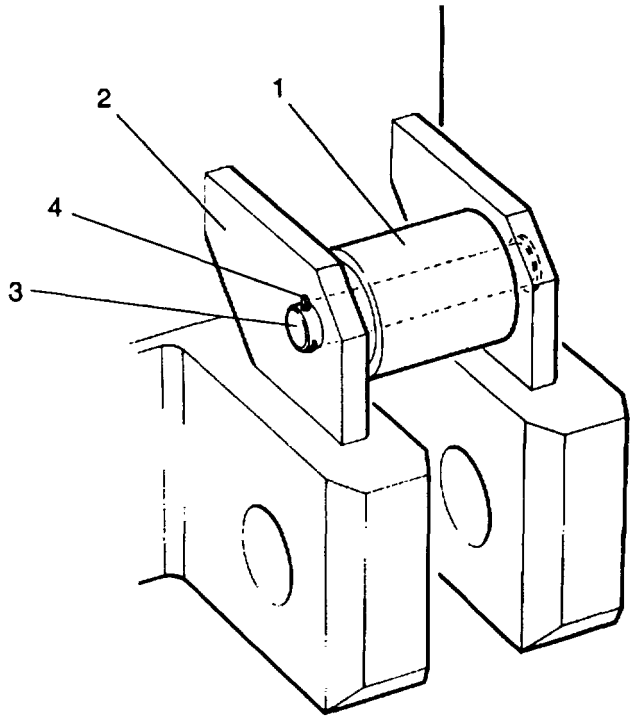
b. Service/Repair

(1) Clean pin with crocus cloth.

(2) Clean holes in housing with crocus cloth.

(3) Replace components that are damaged, distorted or bent.

c. Installation



(1) Hold resilient mount (1) in housing (2) and insert pin (3) until head of pin is fully seated against housing.

(2) Push cotter pin (4) through hole in pin (3), and bend prongs around end of pin.

NOTE

Resilient mount should rotate on pin (pin should not rotate in frame). If the pin is rotation in housing, report to Unit Maintenance.

8-6 BANKSEAT BEAM, JUNCTION PANEL, TOP PANEL, LAUNCHING NOSE HEAVY) (Shoot Bolt)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

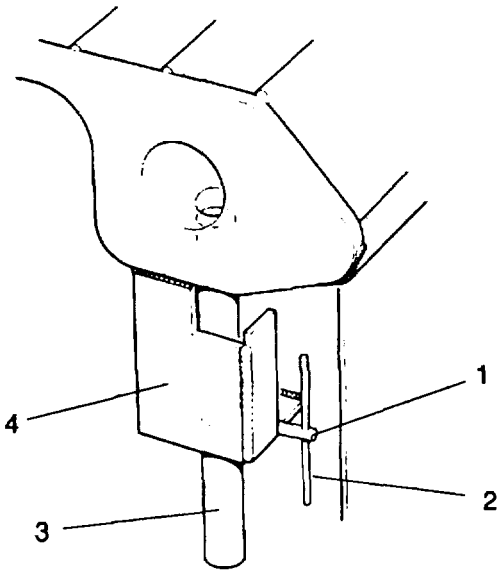
8 inch pliers or visegrips
Small diameter bar (1/8 - 3/16 in)
6 inch flat file

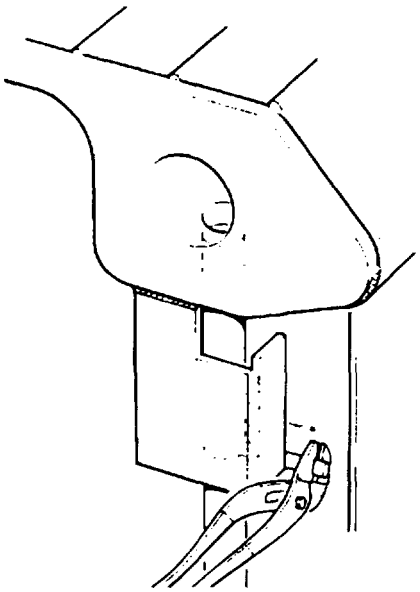
Materials Required

Thread locking compound (22, Appendix D)
Clean cloths
Lubricating oil (2, Appendix D)

Condition Description

Shoot bolt in component.
Component in upright position on raised, flat surface.
No obstruction under pin jaws.





NOTE

Two types of shoot bolt handle are used. One type has a 3/16 In (4.8 mm) hole through the unthreaded end of the handle; the other type has not.

a. Removal

(1) If handle (1) has hole, insert small diameter bar (2) through hole.

(2) Hold bottom of shoot bolt (3), then unscrew and remove handle (1) by turning handle counterclockwise.

(3) If handle has no hole, grasp handle as dose to threaded end as possible with pliers or visegrips. Use a piece of cloth between jaws and shoot bolt handle to reduce burring on handle.

(4) Remove shoot bolt (3) by lowering down through housing (4).

b. Service/*R*epair

(1) Inspect shoot bolt and handle for burrs, cracks and breaks.

(2) Remove burrs with flat file.

(3) Clean shoot bolt and handle with an oil soaked cloth.

(4) Wipe dry with a clean, dry cloth.

(5) Determine serviceability of cracked or broken components, and replace if necessary.

c. Installation

NOTE

Shoot bolts In launching nose sections do not have a short end, and the handle hole Is centered.

(1) With short end facing downward, insert shoot bolt (3) into bottom of housing (4).

(2) Position handle hole above bottom plate of housing, coat threads with thread locking compound, hold shoot bolt in place and screw in the handle (1) by hand.

(3) Tighten the handle with small diameter bar, where possible, or pliers/visegrips.

8-7 BOTTOM PANEL (Shoot Bolt)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

Flat file

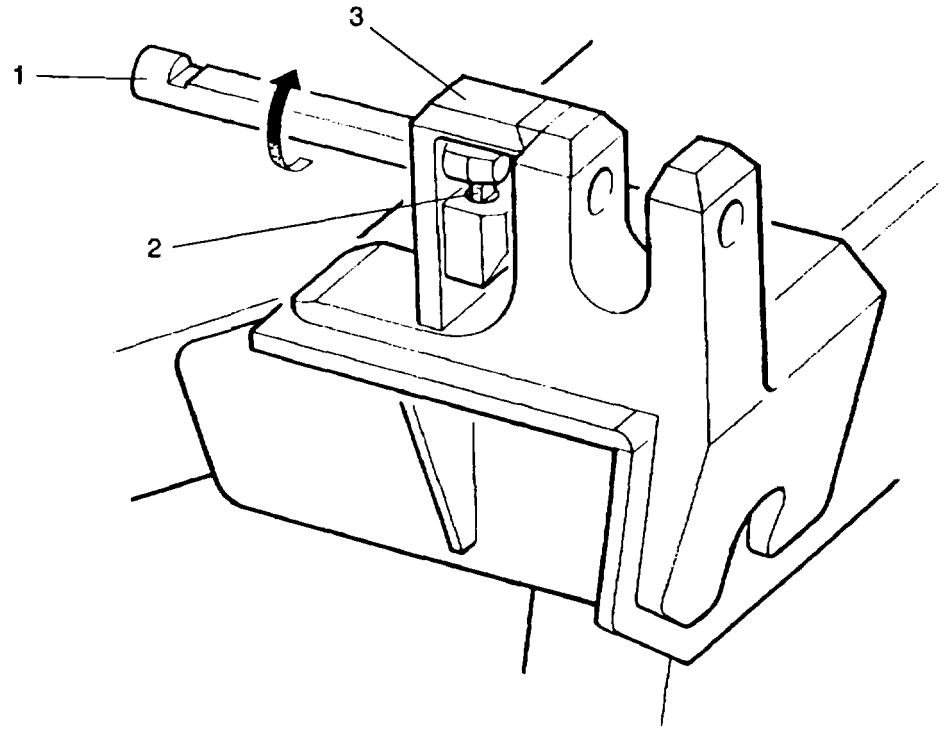
Materials Required

Clean cloths
Lubricating oil (2, Appendix D)
Grease, Auto and Art. (GAA) (1, Appendix D)

Condition Description

Shoot bolt in component.
Component on flat surface.

a. Removal



(1) Pull shoot bolt (1) towards open position.

(2) Turn shoot boltthrough 180° so that plunger (2) is depressed and rear slot is clear of plunger, then pull shoot bolt from housing (3).

b. Service/Repair

(1) Clean shoot bolt with an oil soaked cloth, then wipe dry with a clean, dry cloth.

(2) Inspect for cracks, breaks and burrs.

(3) Remove burrs with a flat file.

(4) Replace shoot bolt if cracked, bent or broken.

c. Installation

(1) Insert small end of shoot bolt (1) into housing (3) (slots uppermost). Shoot bolt depresses plunger (2) as it is pushed through housing.

(2) Rotate shoot bolt through 1800 (slots facing down) and lock in required position.

8-8 ROLLER BEAM (Jack Hood, Roller Catch)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP

Tools Required

10 inch screwdriver
8 Inch pliers
1 lb ball peen hammer
6 inch flat file

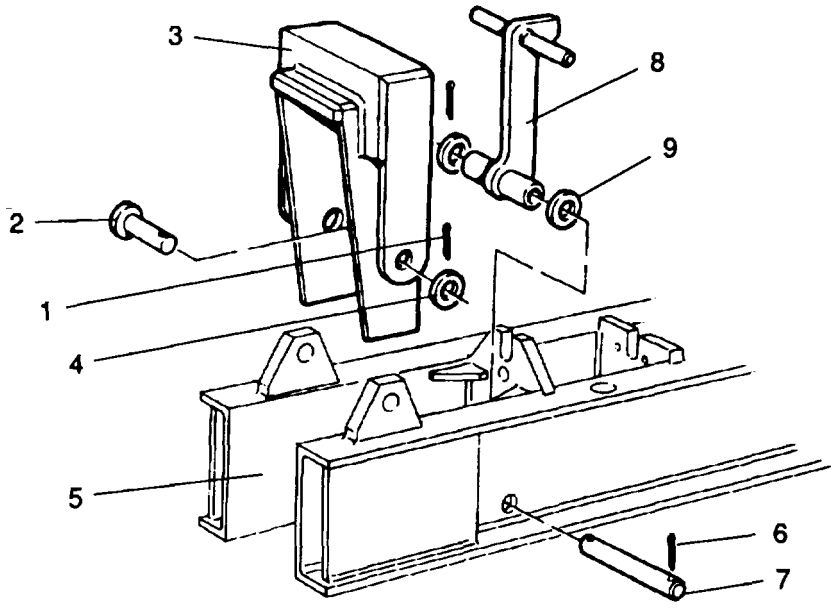
Materials Required

Clean cloths
Crocus cloths (25, Appendix D)

Equipment Conditions

Roller beam on raised flat surface.

a. Removal



(1) Remove cotter pins (1) from headed pins (2), securing both sides of jack hood (3), with hammer, screwdriver and pliers.

(2) Support jack hood and withdraw headed pins (2) collecting washers (4) and lift hood off roller beam (5).

(3) Remove cotter pin (6) from one end of headless pin (7).

(4) Support roller catch (8) then remove pin (7) collecting washers (9).

b. Service/Repair

(1) Clean jack hood, roller catch, pins and pin holes with clean cloth.

(2) Remove any small burrs on components with crocus cloth or file.

(3) Inspect hood, roller catch and pins for damage/distortion and if unusable replace with new.

c. Installation

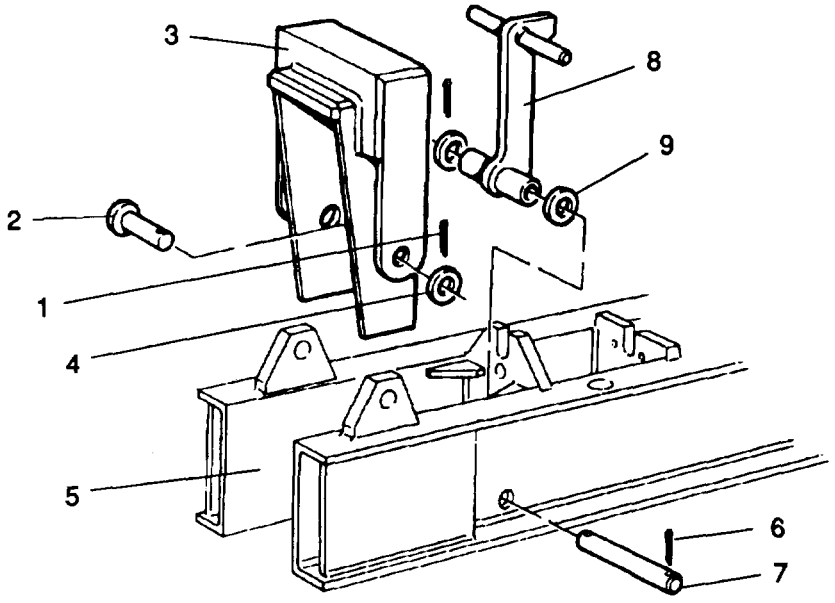
(1) Fit roller catch (8) in roller beam (5) with washers (9) then slide/tap pin (7) through until cotter pin holes are just clear.

(2) Tap new cotter pin (6) in position and bend ends around headless pin.

(3) Move catch backwards and forwards to ensure freedom of movement.

(4) Position jack hood (3) on roller beam, then slip headed pins (2) through hood and brackets from inside and secure with washers (4) and cotter pins (1).

(5) Move hood backwards and forwards to ensure freedom of movement.



8-9 LAUNCHING NOSE CROSS GIRDER (Safety Catch)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP

Tools Required

10 inch screwdriver
8 inch pliers
1 lb ball peen hammer
6 inch flat file

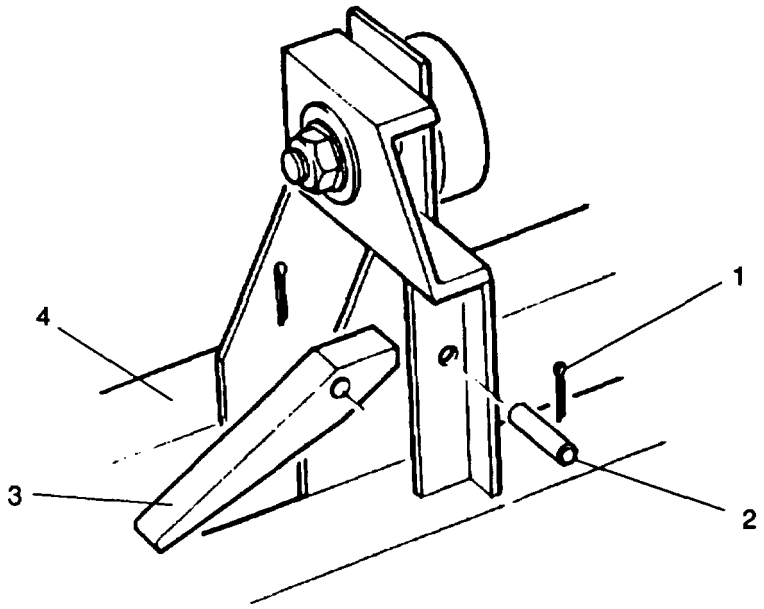
Materials Required

Clean cloth

Equipment Required

Girder on raised flat surface

a. Removal



(1) Remove cotter pins (1) from headless pin (2) with hammer, screwdriver and pliers.

(2) Remove safety catch (3) from girder (4).

b. Service/Repair

(1) Clean safety catch pin and pin holes with cloth.

(2) Remove any small burrs on catch with file

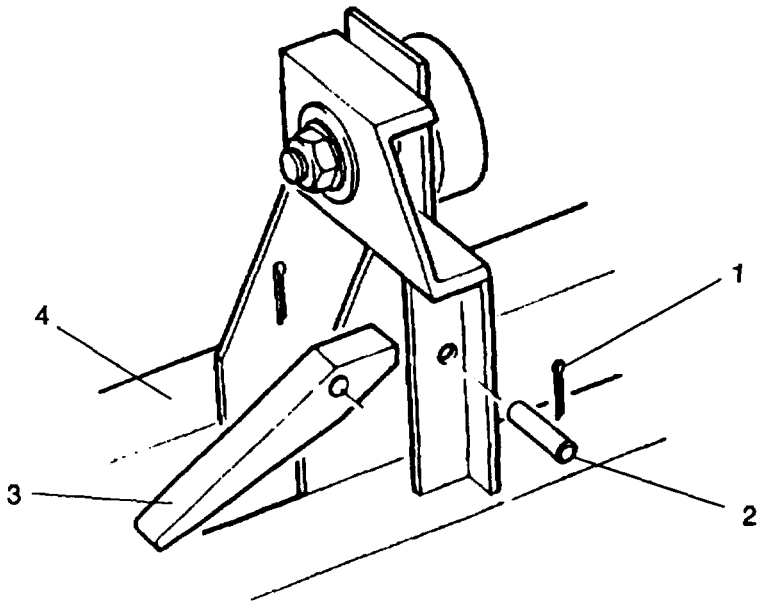
(3) Inspect catch for damage, cracks or distortion and if evident replace with new.

c. Installation

(1) Position safety catch (3) between brackets on girder (4).

(2) Push or tap headless pin (2) through brackets and catch and secure with new cotter pins (1) bending ends around pin (2).

(3) Move catch up and down to ensure freedom of movement.



8-10 LAUNCHING NOSE CROSS GIRDER (Pins and Chains)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

7/16 AF Open end wrench
8 inch pliers
6 inch flat file
6 inch screwdriver

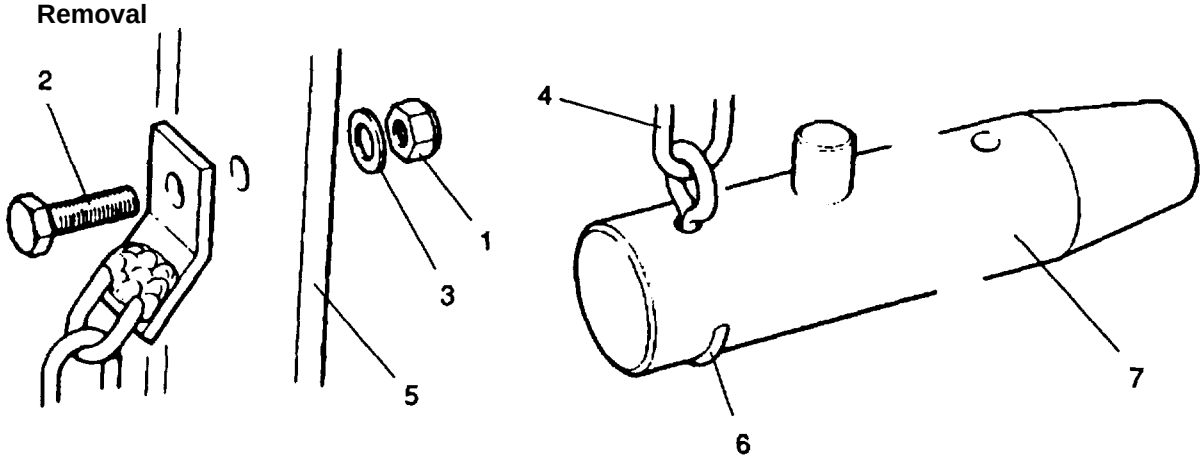
Materials Required

Clean cloths
Lubricating oil (2, Appendix D)

Equipment Conditions

Chain and pin attached to component.

a. Removal



(1) Remove locknut (1) from bolt (2), collecting washer (3), using open end wrench then remove chain (4) and bolt (2) from cross girder (5).

(2) Straighten prongs of cotter pin (6) with pliers and screwdriver then remove cotter pin from captive pin (7).

(3) Open prongs of cotter pin (6) then remove cotter pin from chain link (4).

b. Service/Repair

(1) Clean components with an oil soaked cloth, then dry with a clean, dry cloth.

(2) inspect components for breaks, cracks, corrosion and other damage.

(3) Inspect nut and bolt for damage to threads.

(4) Remove burrs from captive pin (7) with flat file.

(5) Replace components as necessary.

c. Installation

(1) Open prongs of cotter pin (6), slide chain link (4) through prongs, then close prongs.

(2) Insert cotter pin (6) through hole in captive pin (7) until fully seated, then bend prongs around captive pin.

(3) Secure chain to cross girder with bolt (2), new locknut (1), and washer (3).

8-11 HYDRAULIC JACK (15T)

This task covers:

a. Service

INITIAL SETUP:

Tools Required

Jack handle

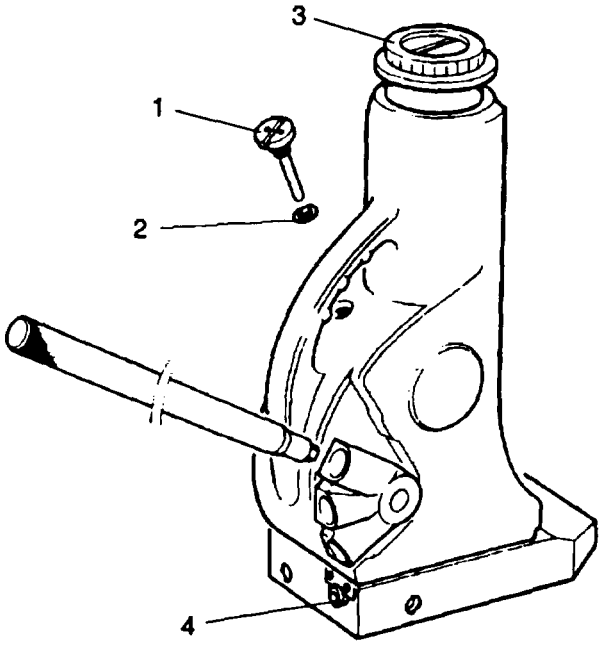
Materials Required

Clean cloths
Hydraulic oil (2, Appendix D)

Equipment Conditions

Jack sitting on level surface.

a. Service



(1) Remove filler cap/dipstick (1) with screwdriver.

(2) Inspect seal (2) and replace if necessary.

(3) Fill to no more than 1 inch above mark on dipstick with clean hydraulic oil.

(4) Install filler cap (1).

(5) Pump jack handle until ram (3) is raised to full extent.

(6) Unscrew release valve screw (4) with jack handle no more than 1 to 1 1/2 turns.

(7) Press ram (3) down as far as it will go and listen for the release of air.

(8) Screw in and tighten release valve (4).

(9) Repeat steps (5) to (8) until all air is expelled from the system.

8-12 HYDRAULIC JACK (20T)

This task covers:

Service

INITIAL SETUP:

Tools Required

Jack handle

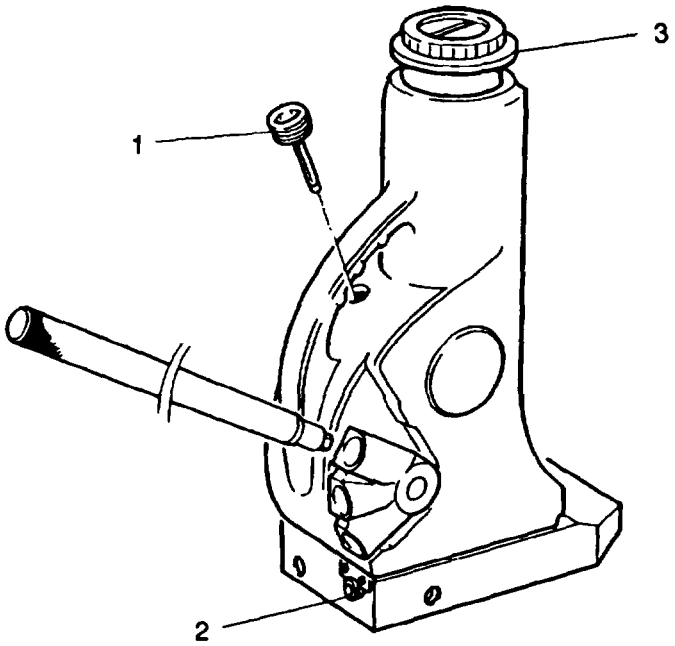
Materials Required

Clean cloths
Hydraulic oil (2, Appendix D)

Equipment Conditions

Jack sitting on level surface.

Service



(1) Remove filler screw/dipstick (1) with hexagon end of jack handle.

(2) Top-up to level indicated on dipstick with fresh, clean hydraulic oil, MIL- L- 7870A

(3) Install filler screw hand tight only.

(4) Check that release valve screw (2) is tight.

(5) Pump jack handle until ram (3) is raised to full extent.

(6) Unscrew release valve screw (2) with jack handle no more than 1 to 1 1/2 turns.

(7) Press ram (3) down as far as it will go.

(8) Screw in and tighten release valve (2).

(9) Repeat steps (5) to (8) until all air is expelled from the system.

(10) Tighten filler screw (1) with jack handle.

8-13 JACK POST

This task covers:

a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

1 lb ball peen hammer
Drift pin
8 inch pliers
6 inch flat file
6 inch screwdriver

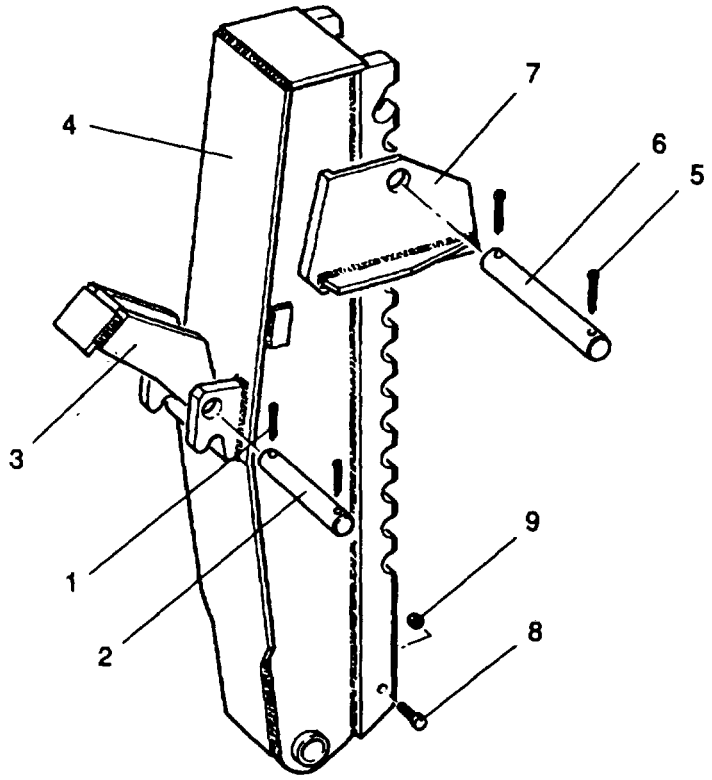
Materials Required

Crocus cloth (25, Appendix D)

Equipment Conditions

Component on raised, flat surface.

a. Removal



(1) Straighten prongs of cotter pins (1) with pliers and screwdriver, then remove from pin (2).

(2) Tap out pin (2) using drift pin and hammer.

(3) Remove wedge (3) from jack post (4).

(4) Straighten prongs of cotter pins (5), then remove from pin (6).

(5) Tap out pin (6) from jack hood (7).

(6) Remove screws (8) and nuts (9), then slide jack hood (7) from jack post (4).

b. Service/Repair

(1) Clean pins (2) (6) and holes in wedge (3), jack hood (7) and jack post (4) with crocus cloth.

(2) Clean nose pin hole with crocus cloth.

(3) Remove burrs from components with flat file.

(4) Replace components that are damaged, distorted or bent.

c. Installation

(1) Install jack hood (7) on jack post (4), then fit screws (8) and nuts (9).

(2) Insert pin (6) and check that jack hood (7) engages freely in the fourteen slot positions.

(3) Insert new cotter pins (5) through pin (6), then bend prongs in opposite directions around end of pin.

(4) Install wedge (3) in mounting on jack post (4).

(5) Insert pin (2) and check that wedge (3) pivots freely.

(6) Insert new cotter pins (1) through pin (2), then bend prongs in opposite direction around pin.

8-14 ADJUSTABLE SUPPORT (Shoot Bolt)

This task covers:
a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

Small diameter bar (1/8 - 3/1S in)
8 inch pliers or visegrips
6 inch flat file

Materials Required

Clean cloths
Lubricating oil (2, Appendix D)
Thread locking compound (20, Appendix D)

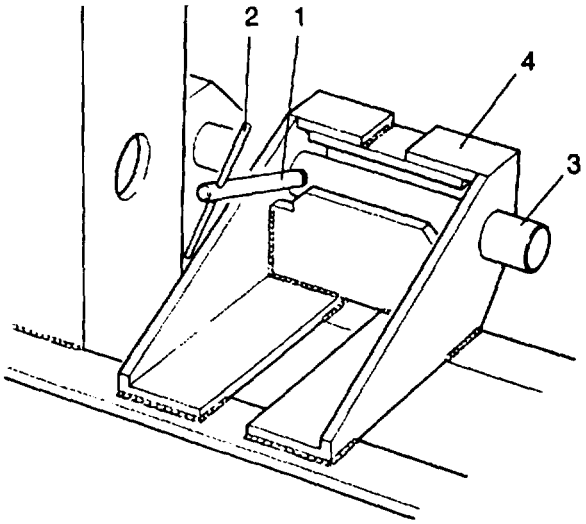
Condition Description

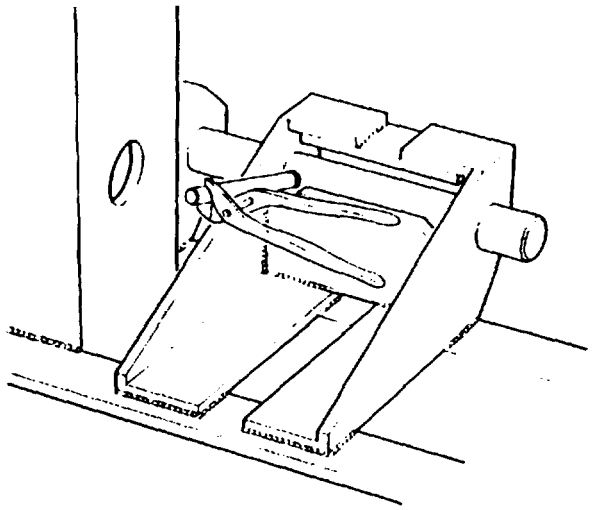
Shoot bolt in component.
Component upright on raised, flat surface.

a. Removal

NOTE

Two types of shoot bolt handle are used. One type has a 3/16 in (4.8 mm) hole through the unthreaded end of the handle; the other type has not.





(1) If handle (1) has hole, insert small diameter bar (2) through hole.

(2) If handle has no hole, grasp handle as close to threaded end as possible with pliers or visegrips. Use a piece of cloth between jaws and shoot bolt handle to reduce burring on handle.

(3) Hold shoot bolt (3), then unscrew and remove handle (1) by turning handle counterclockwise.

(4) Remove shoot bolt (3) from housing (4).

b. Service/Repair

(1) Inspect shoot bolt and handle for burrs, cracks and breaks.

(2) Remove burrs with flat file.

(3) Clean shoot bolt and handle with an oil soaked cloth.

(4) Wipe dry with a clean, dry cloth.

(5) Replace shoot bolt if cracked, bent or broken.

c. Installation

(1) Insert shoot bolt (3) into housing (4), until handle hole is inside of housing.

(2) Ensure threads of handle are coated with thread locking compound, hold shoot bolt in place and screw in the handle (1).

(3) Tighten the handle with small diameter bar, where possible, or pliers/visegrips.

8-15 ADJUSTABLE SUPPORT (Pins and Chains)

This task covers:

a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

Tools Required

8 inch pliers
6 inch flat file
1 lb ball peen hammer
6 inch screwdriver
5/16 inch diameter drift pin

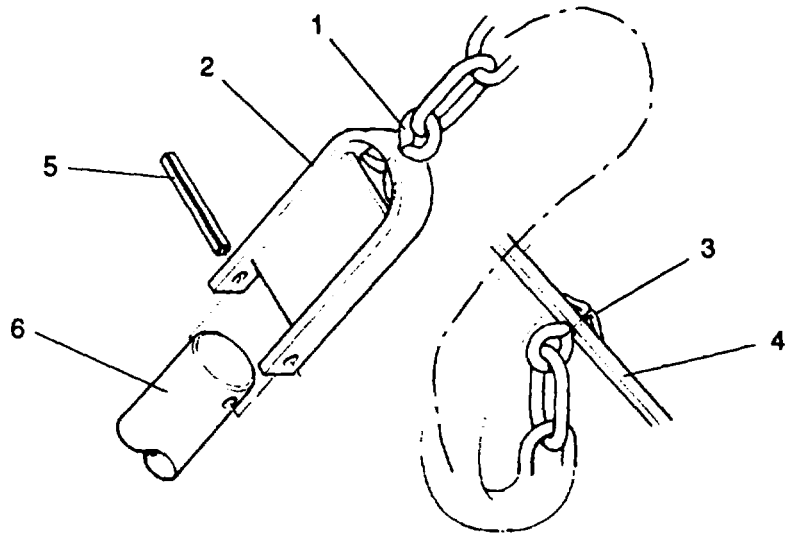
Materials Required

Clean cloths
Lubricating oil (2, Appendix D)

Equipment Conditions

Pins and chain connected to component.

a. Removal



(1) Straighten prongs of cotter pin (1) in support pin handle (2) with pliers and screwdriver, then remove cotter pin from support pin handle.

(2) Straighten prongs of cotter pin (3) in adjustable support (4), then remove cotter pin and chain from adjustable support.

(3) Using drift pin and hammer, drive out the spring pin (5) securing the handle to the support pin (6).

b. Service/Repair

(1) Clean components with an oil soaked cloth, then dry with a clean, dry cloth.

(2) Inspect components for breaks, cracks, corrosion and other damage.

(3) Remove burrs from support pin (6) with flat file.

(4) Replace components as necessary.

c. Installation

(1) Align holes of support pin (6) with holes in support pin handle and drive in new spring pin.

(2) Insert cotter pin (1) through support pin handle (2), then bend prongs of cotter pin outwards, as shown.

(3) Insert cotter pin (3) through hole in adjustable support (4), then bend prongs of cotter pin outwards, as shown.

8-16 ADJUSTABLE SUPPORT (Levelling Screw)

This task covers:

a. Removal b. Service/Repair c. Installation

INITIAL SETUP:

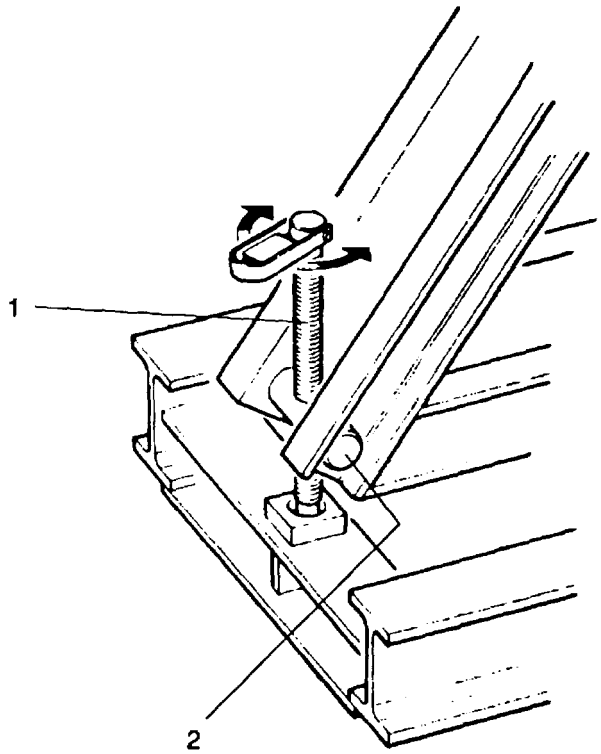
Materials Required

Clean cloths
Lubricating oil (2, Appendix D)
Grease, Auto and Art. (1, Appendix D)

Equipment Conditions

Leveling screw in adjustable support. Adjustable support removed from roller beam assembly and placed on flat surface.

a. Removal



NOTE
If levelling screw is bent, do not attempt to remove it. Report condition to Unit Maintenance.

(1) Unscrew levelling screw (1) from swivel mount (2).

(2) Do not remove swivel mount (2) from support.

b. Service/Repair

(1) Clean levelling screw and swivel mount threads with oil soaked cloth, then dry with a clean, dry cloth.

(2) Apply light coat of grease to threads of levelling screw.

c. Installation

(1) Install levelling screw (1) in swivel mount (2).

(2) Check that screw tums freely throughout its length.

8-17 FIXED SUPPORT (Pin and Trunnion)

This task covers:

a. Removal b. Inspection c. Pre-Load Check of Bearing

INITIAL SETUP:

Tools Required

1 lb ball peen hammer
Drift pin
8 inch pliers
6 inch flat file

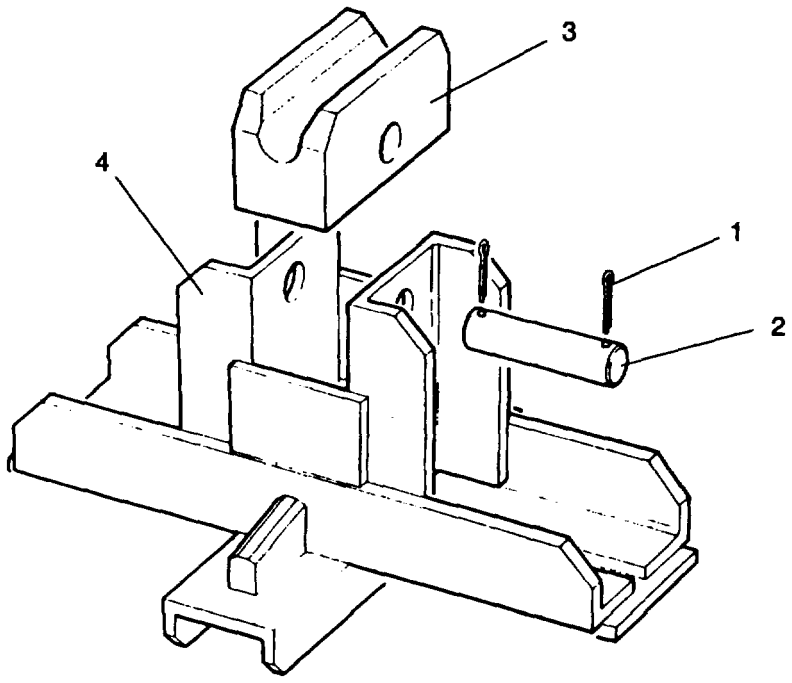
Materials Required

Crocus cloth (25, Appendix D)

Equipment Conditions

Component in upright position on raised, flat surface.

a. Removal



(1) Straighten prongs of cotter pins (1) with pliers and screwdriver, then remove from pin (2).

(2) Tap out pin (2) using drift pin and hammer.

(3) Lift out trunnion (3) from fixed support (4).

b. Service/Repair

(1) Clean pins (2) and holes in fixed support (4) and trunnion (3) with crocus cloth.

(2) Remove burrs with flat file.

(3) Replace components that are damaged, distorted or bent.

c. Installation

(1) Install trunnion (3) in fixed support (4).

(2) Insert pin (2) and check that trunnion (3) pivots freely.

(3) Insert new cotter pins (1) through each end of pin (2), then bend prongs in opposite directions around end of pin.

8-18 JACKING BRACKET (Pins and Pulleys)

This task covers:
a. Removal b. Serviced/Repair c. Installation

INITIAL SETUP:

Tools Required

Drift pins
1 lb ball peen hammer
8 inch pliers
6 inch flat file

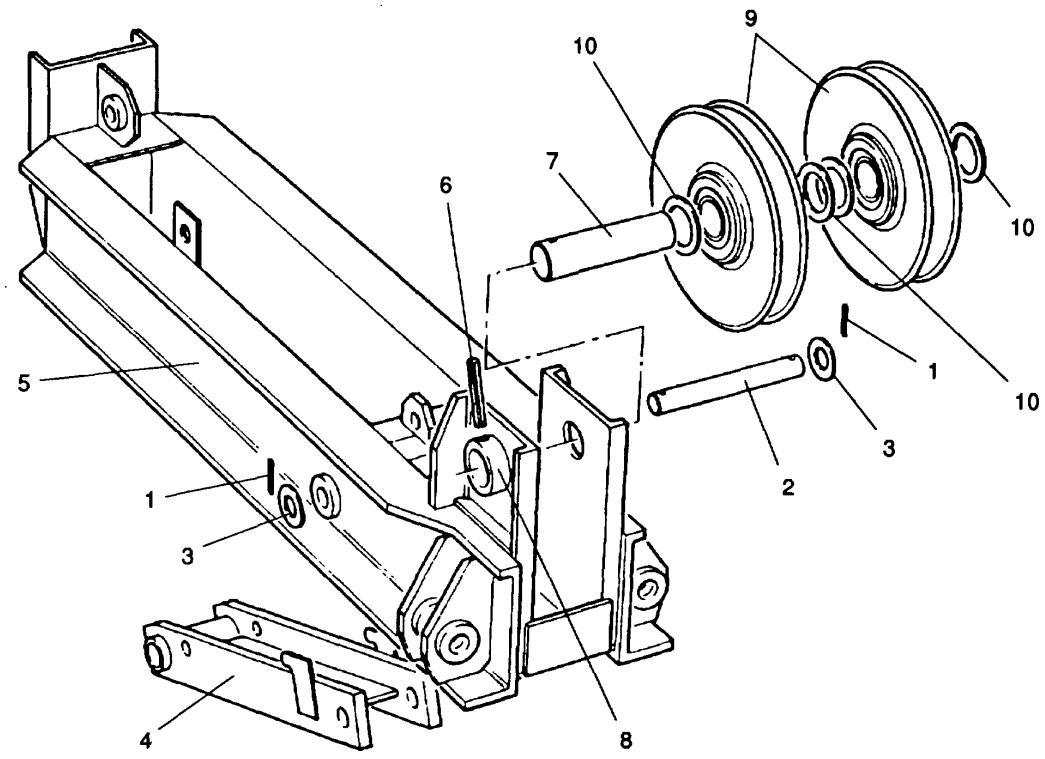
Materials Required

Clean cloths
Crocus cloth (25, Appendix D)

Equipment Conditions

Component in upright position on raised, flat surface.

a. Removal



(1) To remove link pin and link.

(a) Straighten prongs of cotter pins (1) with pliers and screwdriver, then remove from pin (2).

(b) Remove washers (3) from pin (2).

(c) Tap out pin (2) with drift pin and hammer, then remove link (4) from jacking bracket (5).

(2) To remove pulley pin and pulleys.

(a) Tap out spring pin (6) from pin (7) and boss (8) with drift pin and hammer.

(b) Slowly tap out pin (7) from boss (8) end with drift pin and hammer.

(c) Remove pulleys (9) and thrust washers (10) from inside jacking bracket (5), as they become free.

b. Service/Repair

(1) Clean pin (2) and pin holes in link (4) with crocus cloth.

(2) Clean pin (7) and bore of pulleys (9) with a clean, dry cloth. Carefully remove burrs on pin ends with crocus cloth or flat file.

(3) Clean all pin holes.

(4) Inspect components for breaks, cracks, corrosion and other damage.

(5) Replace components as necessary.

c. Installation

(1) To install pulley pin and pulleys

(a) Insert pin (7) from boss end, and install pulleys (9) and thrust washers (10) as pin is gradually tapped/pushed through

(b) Ensure to align hole in end of pin (7) with holes in boss (8).

(c) Tap new spring pin (6) through boss (8) and pin (7).

(2) To install link and link pin.

(a) Position link (4) in jacking bracket (5), align holes then install pin (2) through link and jacking bracket.

(b) Install washers (3) on pin (2).

(c) Insert cotter pin (1) through each end of pin (2), and bend ends of cotter pin in opposite directions around pin.

8-19 PULLER

This task covers:
a. Removal c. Inspection e. Pre-Load Check of Bearing

INITIAL SETUP:

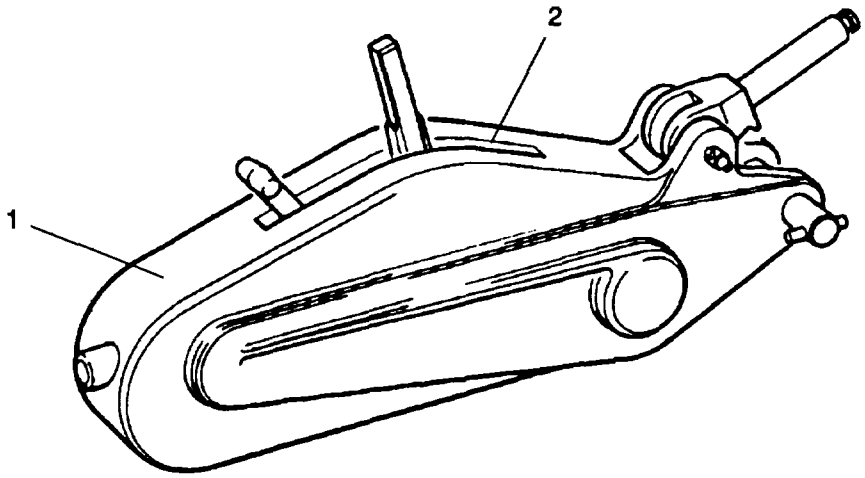
Materials Required

Heavy gear oil (21, Appendix D)
Cleaning solvent (22, Appendix D)
Suitable bath
Protective gloves
Protective goggles
Clean cloths

Equipment Conditions

Puller removed from post tensioning assembly, or jacking bracket.

Service



(1) Inspect for damage, cracks, corrosion, bent or broken parts. If there is any doubt about serviceability of puller, make a full report on condition to Unit Maintenance.

(2) Remove any caked on mud etc. from casing (1) and slot (2).

WARNING

Wear protective gloves and goggles. Cleaning solvent Is toxic and flammable. Use only In a well ventilated area. Avoid breathing the fumes, and skin contact. Do not use in excessive amounts, and keep away from flames.

(3) Place puller in bath of cleaning solvent and allow to soak for an hour.

(4) Remove puller from bath, and shake vigorously to loosen and remove foreign matter. If necessary, allow more time to soak.

(5) Ensure that all solvent is drained and evaporated from puller before adding lubricant.

WARNING

Lubricants containing molybdenum disulphide must not be used.

(6) Pour gear oil through the slot (2), shake the puller then allow to drain.

NOTE
Excess lubrication cannot cause the wire rope to slip.

(7) Wipe oil from outside surfaces.

8-20 ANTI-SKID COATING

This task covers:

Patch Painting

INITIAL SETUP:

Tools Required

Paint brushes
Protective gloves
Protective face mask/goggles
Wire brush or scraper

Materials Required

Epoxy pitch binder EC21BC (Spec. AFS 801A), consisting of
Epoxy base EC21/B and pitch curing agent EC21/C (23, Appendix D)
Fused bauxite grit (24, Appendix D)
Crocus cloth (25, Appendix D)

Equipment Conditions

Component in upright position on raised flat surface.

Patch Painting

WARNING

Epoxy Pitch Binder EC21 BC can cause skin Irritation. Avoid contact of hands and face with both base and curing agent. Apply Barrier cream to hands and exposed areas of skin, and wear protective gloves when mixing and applying. Avoid Inhaling vapor - wear face mask.

NOTE

1. Consult the Local Enviromental Co-ordinator before beginning any painting operation. The use of some materials may be prohibited locally. Refer to Appendix C for data on substitutes.

2. Avoid painting during periods of mist, fog, rain etc., high humidity, or early in the morning, or when condensation affects the working surface. Ideal conditions are a sunny day or low humidity and temperature above 55^0F.

3. Patch painting that has to be carried out In unsatisfactory weather conditions to provide temporary protection, must be removed and re-applied when conditions are satisfactory. WHATEVER THE CONDITIONS PAINTING SHALL BE CARRIED OUT WHENEVER IT IS NECESSARY TO PROVIDE TEMPORARY PROTECTION.

4. If metal surface Is exposed then carry out patch painting in accordance with TM 43-0319.

(1) Mix epoxy base and pitch curing agent parts by volume, or weight. DO NOT THIN.

(2) Only mix sufficient for requirements. Pot life of mix is approximately 3 to 4 hours at 68^{o}F (20^{o}C).

(3) Remove damaged coating(s) until the aluminum surface is reached.

(4) Roughen surface with crocus cloth.

(5) Apply coat of epoxy pitch at approximate rate of 4 1/2 oz/yd^{2} (150 gm/m2), and allow to air dry for approximately thirty minutes.

(6) Liberally cover epoxy pitch coating with bauxite grit at an approximate rate of 3 lb/yd^{2} (1500 gm/m2), and allow coating/bauxite grit to dry for twelve hours.

(7) Lightly brush off any loose grit.

(8) Apply further coat of epoxy pitch at approximate rate of 20 oz/yd^{2} (750 gm/m^{2}), and allow seven days to cure.

(9) Stacking is permitted during the seven day period, provided that no contact is made with the treated surface.

Appendix A
REFERENCES

DA Pamphlet 738-750	The Army Maintenance Management Systems
DMWR 5-5420-212	Depot Maintenance Work Requirement, Medium Girder Bridge
DA FORM 2028-2	Recommended Changes to Equipment Technical Publications
FM 5-34	Engineer Field Data Manual
QSTAG 418	Quadripartite Standardization Agreement 418
SC 5420-97-CL-E52	Supply Catalog, Bridge Fixed: Highway, Aluminum, United Kingdom Medium Girder Bridge 100 Foot Long
SC 5420-97-CL-E53	Supply Catalog, Bridge Erection Set, Fixed Bridge: United Kingdom Medium Girder Bridge
SF 368	Quality Deficiency Report
SC 5420-97-CL-E56	Supply Catalog, Reinforcement Set
STANAG 2010	Military Load Classifications and Markings
TM 5-232	Elements of Surveying
TM 5-312	Military Fixed Bridges
TM 55-450-11	Air Transport of Supplies and Equipment: Helicopter External Loads Rigged with Air Delivery Equipment
TM 5-725	Rigging
TM 5-5420-212-10-2	Operator Manual, Medium Girder Bridge
TM 5-5420-212-23	Unit and Direct Support Maintenance Manual, Medium Girder Bridge
TM 9-2320-211-10	Operators Manual: 5 Ton 6x6, Truck M51A2
TM 9-2320-260-10	Operators Manual: 5 Ton, 6x6, Truck, M817
TM9-2320-272-10	Operators Manual: 5 Ton, 6x6, Truck M929, M929A1, M930, M930A1
TM 9-2330-287-14	Bolster Trailers: 4 Ton, 4-wheel, M796
TM 43-0139	Painting Instructions for Field Use
TM 740-90-1	Administrative Storage of Equipment
TM 746-185	Procedures for Rapid Deployment and Retrograde for Military Bridging
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

Appendix B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS

Section I. INTRODUCTION

B-1 SCOPE

This appendix lists components of end item and basic issue items for the Medium Girder Bridge (MGB) to help you inventory items required for safe and efficient operation.

B-2 GENERAL

The Components of End Item and Basic Issue Items List is divided into the following sections:

a. Section II. Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and/or separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the MGB in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the MGB during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3 EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - Nato Stock Number. Indicates the Nato stock number assigned to the item and will be used for requisitioning purposes.

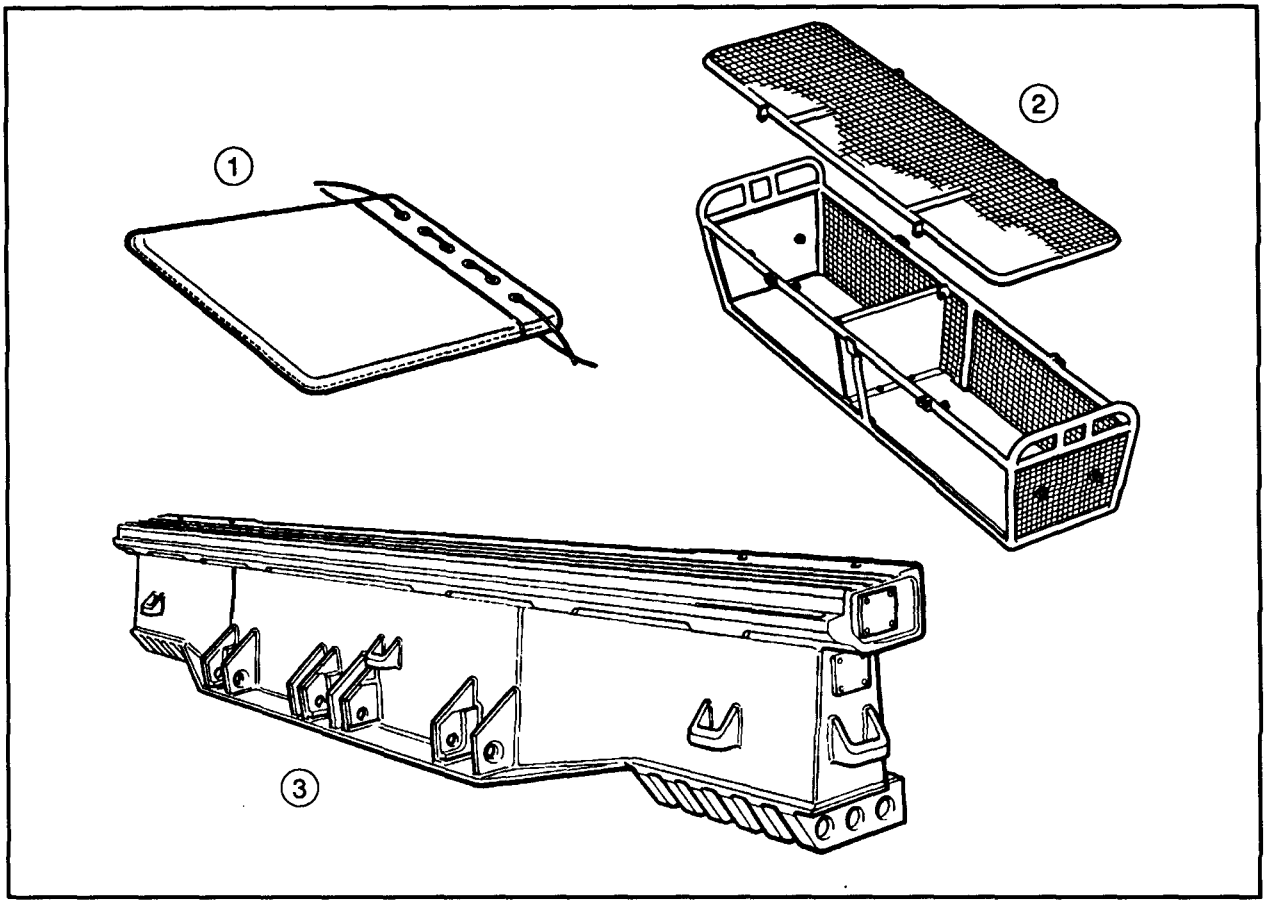
c. Column (3) - Description. Indicates the Federal item and, if required, a minimum description to identify and locate the item. The last line for each item indicates the Functional Source Code Manufacture (FSCM) in parentheses followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

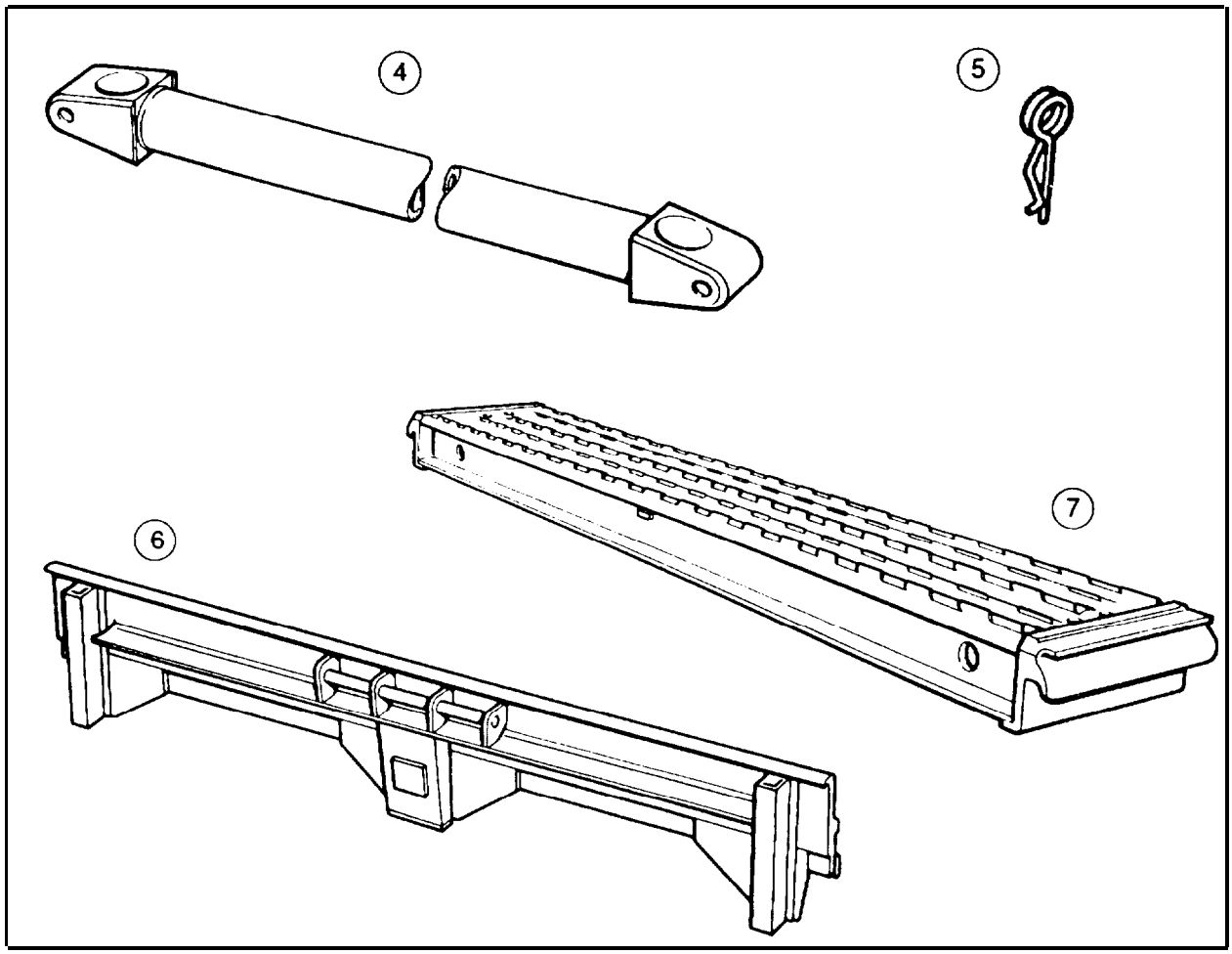
e. Column (5) - Quantity required (Qty reqd). Indicates the quantity of the item authorized to be used with/on the equipment, including spares.

Section II. COMPONENTS OF END ITEM

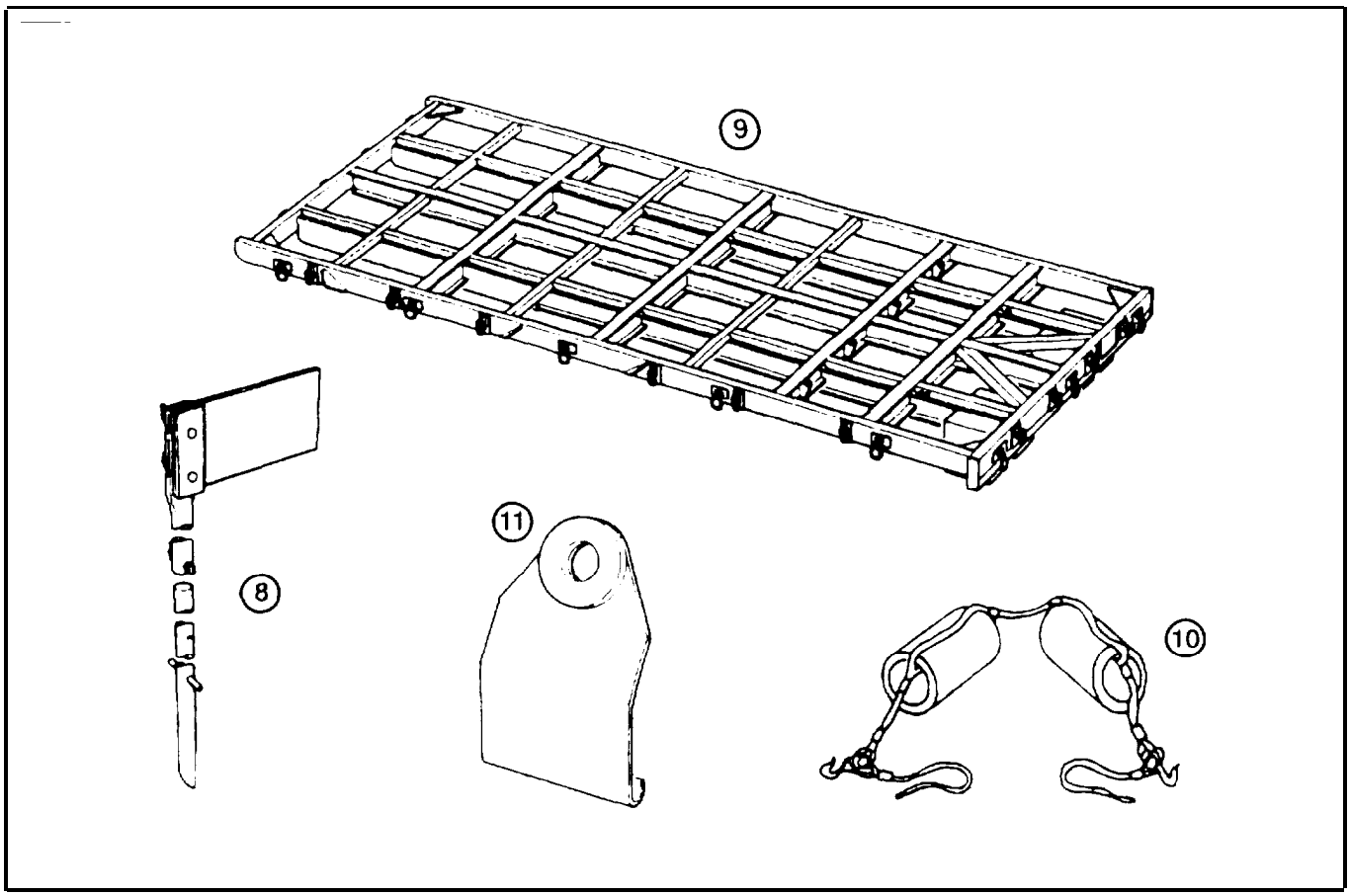
B-4 BRIDGE SET



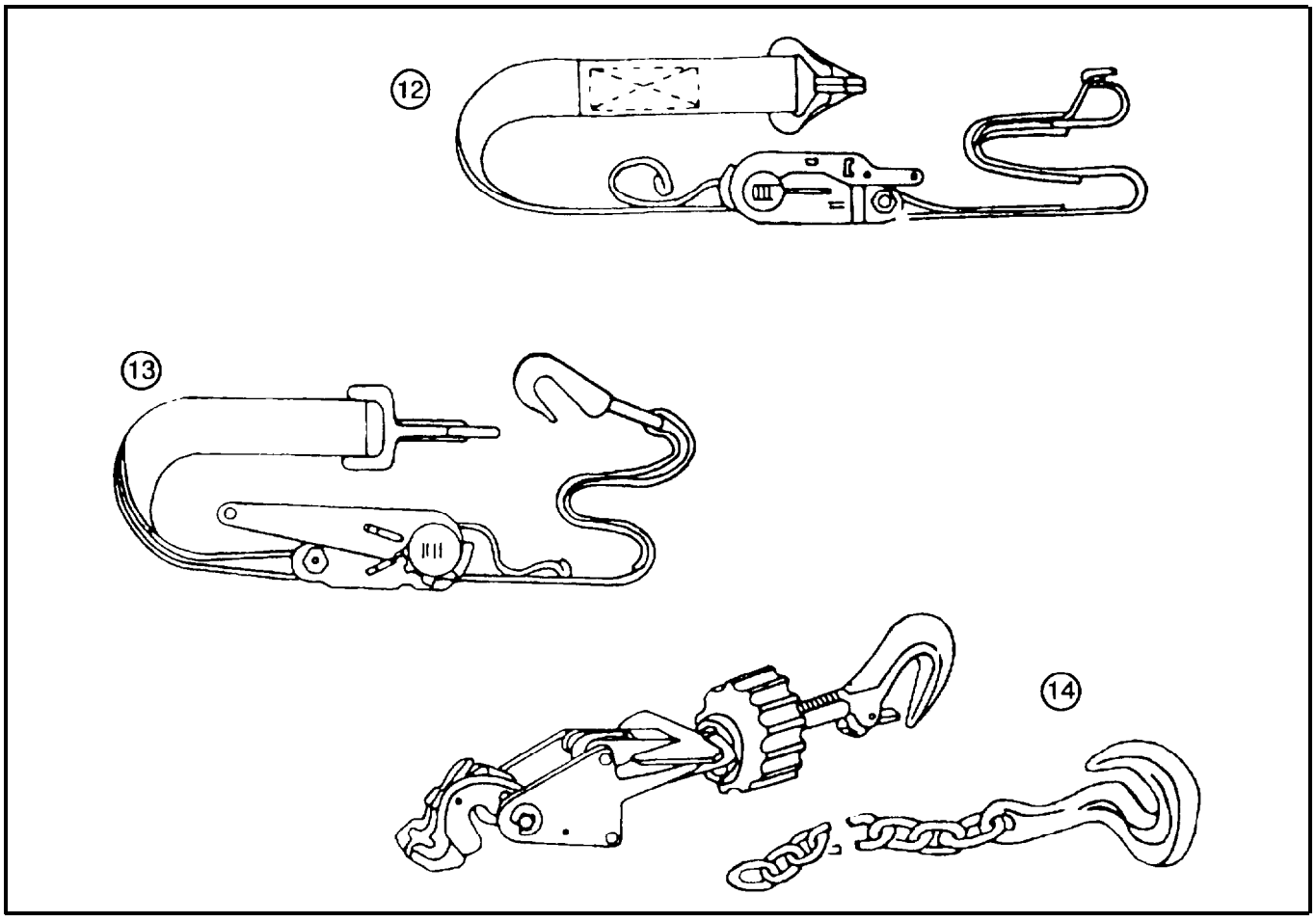
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
1	5420-99-935-7371	BAG, BRIDGING EQUIPMENT: Cloth, duck, cotton, 14 in lg, 10 in w K7705 870-44567	EVK	EA	8
2	5420-99-257-3225	BASKET, BRIDGING EQUIPMENT: 4 ft 9 in lg., 15 in w, 12 in deep K7705 870-44566	EVK	EA	14
3	5420-99-853-6396	BEAM, BANKSEAT, BRIDGE: 13 ft 3 1/2 in lg, 18 in h, 21 3/8 in w K7705 870-44541	EVK	EA	7



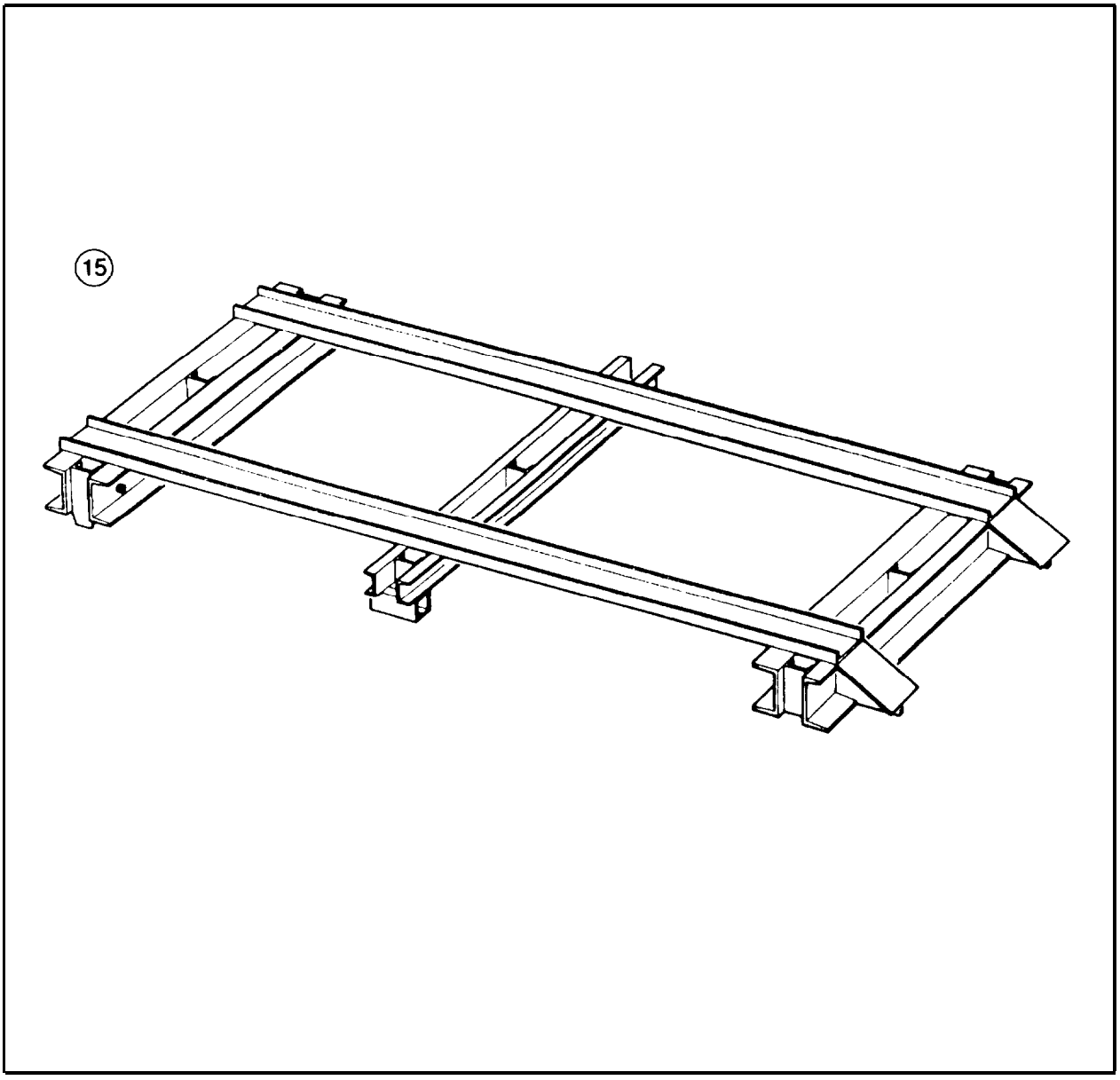
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
4	5420-99-075-3174	BRACE, SWAY: 10 ft 1 ¾ in lg, 3 3/8 in dia. K7705 870-44560	EVK	EA	19
5	5420-99-931-6653	CLIP: Spring steel wire, 4 1/8 in nom lg, approx 1/8, in dia. K7705 870-44576	EVK	EA	200
6	5420-99-967-8213	CURB, BRIDGE: 5 ft 11 in lg, 13 1/2, in h, 5 3/8 in w K7705 870-44551	EVK	EA	42
7	5420-99-7934996	DECK UNIT, BRIDGING: 9 ft 1 in lg, 17 1/4 in w, 6 7/8 in h K7705 870-41091	EVK	EA	74



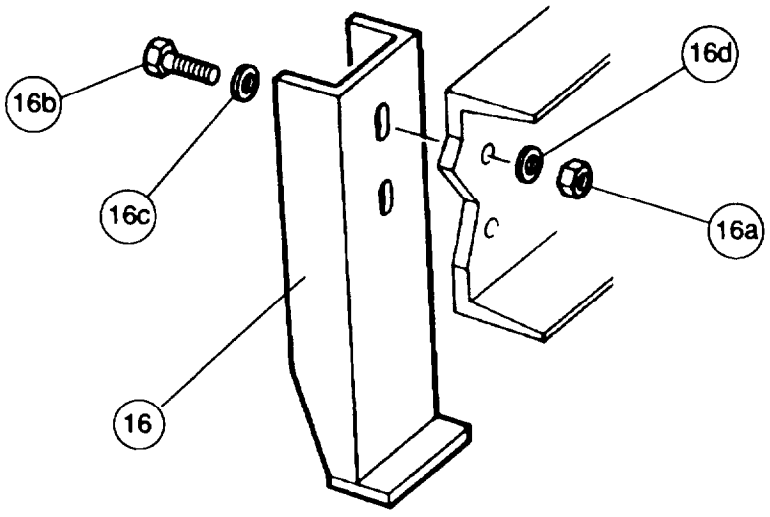
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
8	5420-99-793-4998	MARKER, BRIDGE, GUIDE ASSEMBLY: 5 ft 11 in lg, 1-1/2 in dia. K7705 870-41092	EVK	EA	24
9	5420-99-660-0974	PALLET ASSEMBLY: 14 ft 3 in lg, 6 ft 9-1/4 in w, 12 in h K7705 870-03-01-101	EVK	EA	11
10	5420-99-961-2086	PALLET, REAR BUFFER ASSEMBLY: 8 ft 9 in lg (Truck) K7705 870-03-01-105	EVK	EA	6
11	5420-99-793-5889	LUG, TIE-DOWN: Steel, 4 in w K7705 870-03-01-909	EVK	EA	48



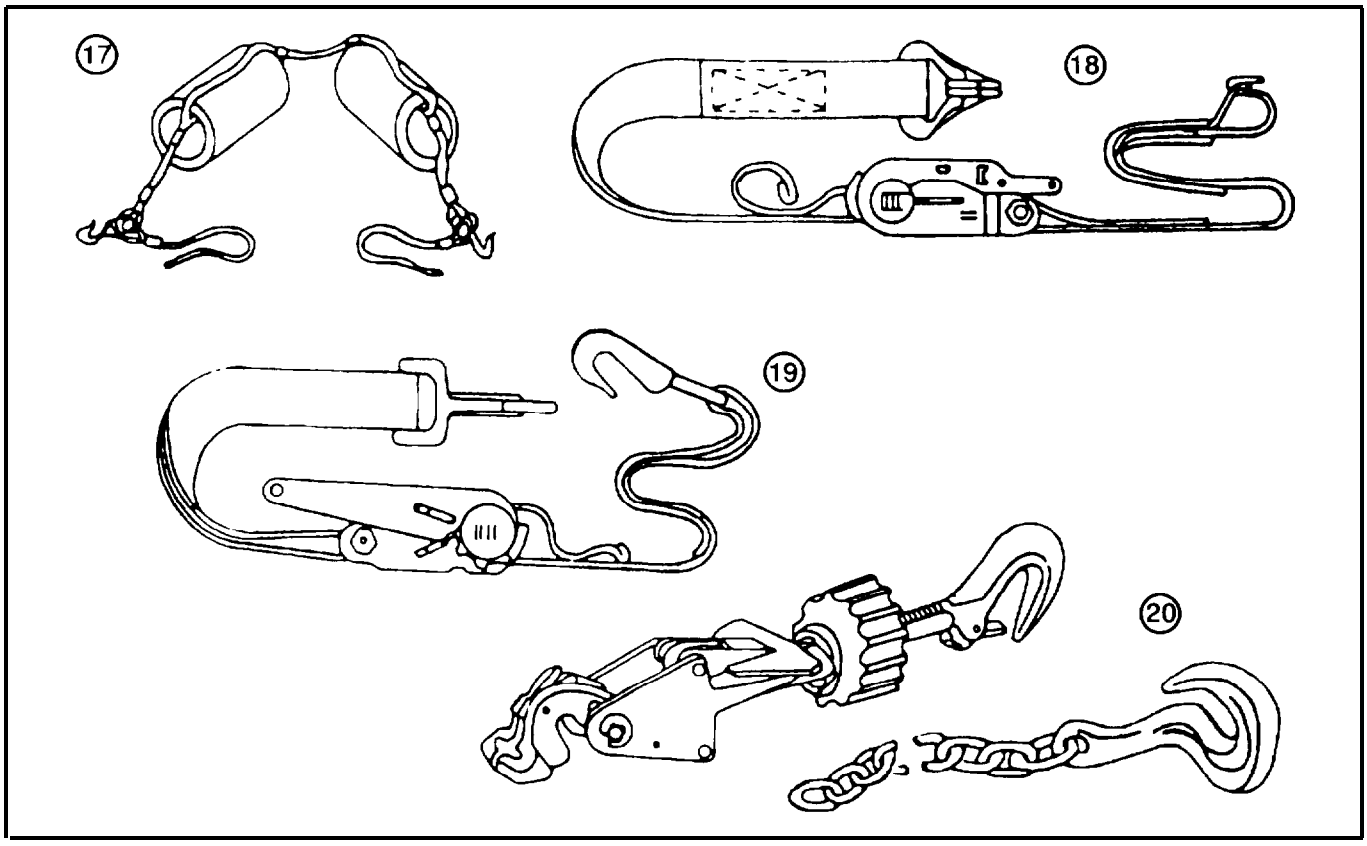
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
12	5420-00-296-9480	STRAP, WEBBING: Nylon, ratchet buckle and snap hooks, steel, 21-1/2 ft lg, 1.72 in w, 5,000 lb capacity (Truck) 97403 13219E3029-1	EVK	EA	24
13	5420-00-296-9499	STRAP WEBBING: Nylon ratchet buckle and snap hooks, steel, (Truck) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVK	EA	54
14	1670-00-545-9062	TIE-DOWN, CARGO: (Truck) 10,000 lb capacity 81349 MIL-T-25959	EVK	EA	12



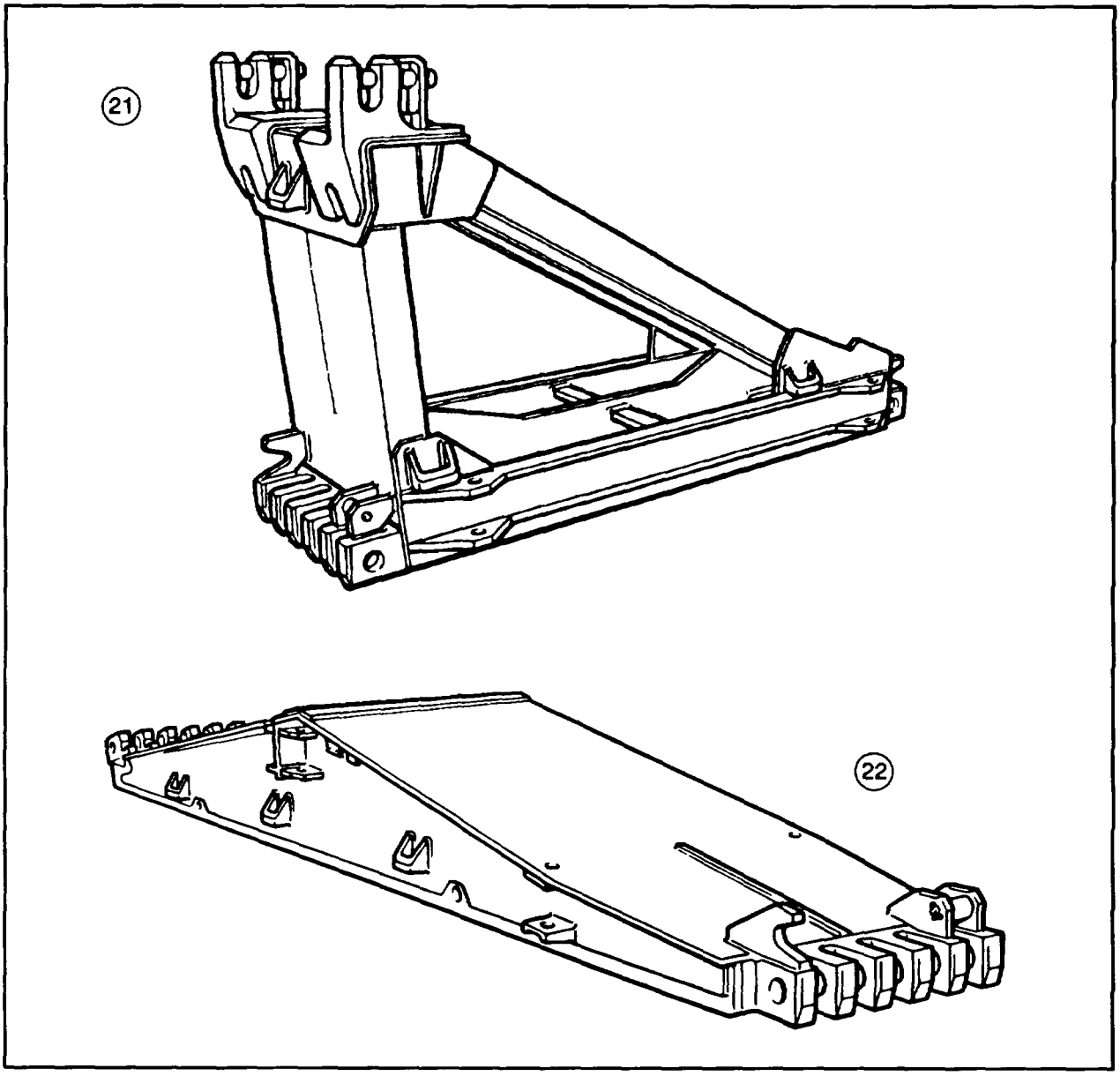
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
15	5420-99411-3934	ADAPTER ASSEMBLY: Steel, 9 ft 1 in lg, 4 ft 10 in w, 10 in h, K7705 870-03-01-1 06	EVK	EA	5



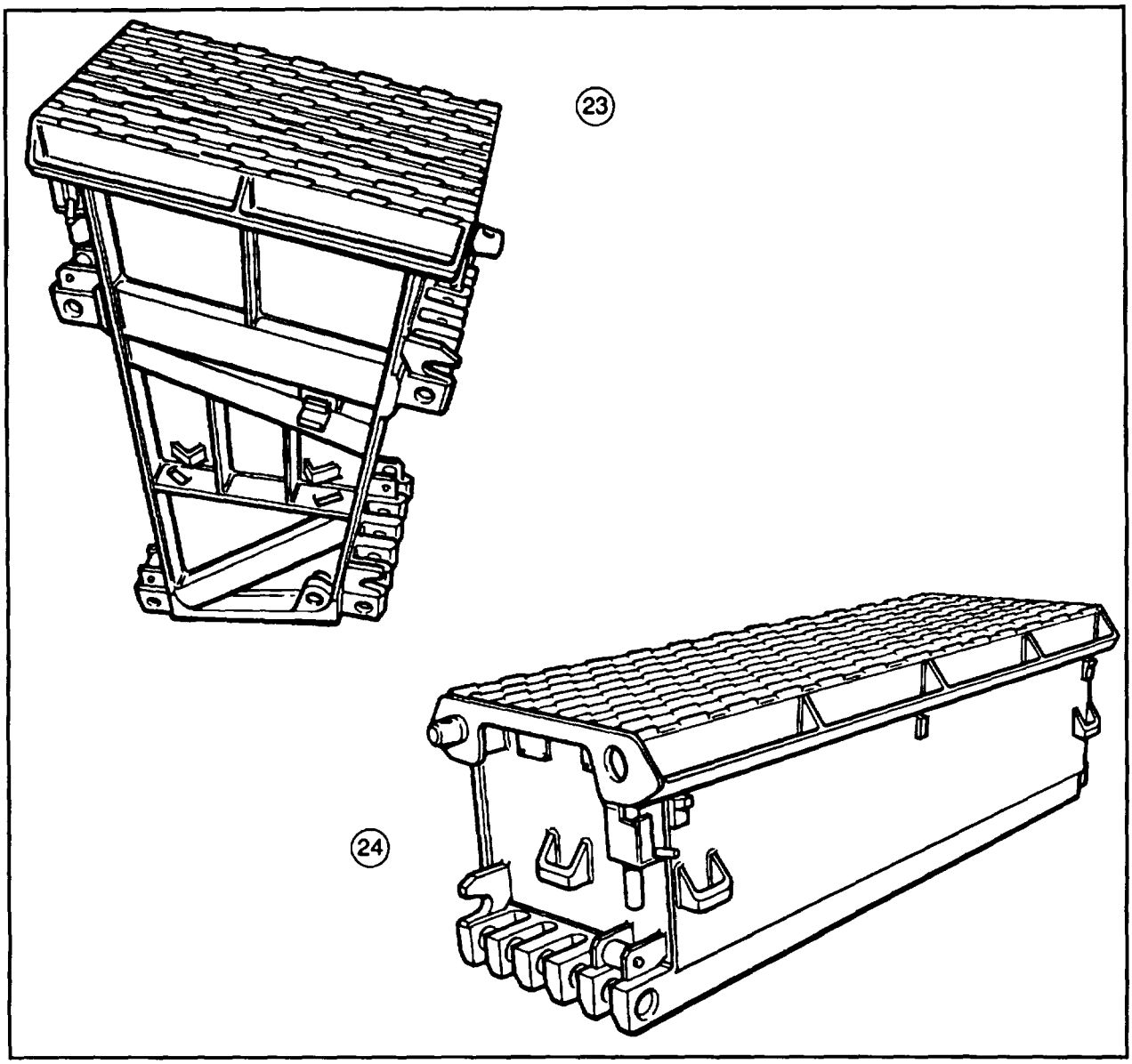
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
16	5420-99-051-3696	BRACKET, ADAPTER: K7705 870-03-01-911 consisting of :	EVK	EA	20
16a	5310-00-732-0558	NUT HEX: Plain, 3/8 - 16 UNC, 96906 MS51967-8	EVK	EA	40
16b	5305-00-725-2317	BOLT HEX HD: 3/8 - 16 UNC, 1 1/2 in lg, steel 96906 MS90728-64	EVK	EA	40
16c	5310-00-080-6004	WASHER FLAT, 3/8 HEAVY: Steel, 96906 MS27183-14	EVK	EA	40
16d	5310-00-637-9541	WASHER, SPRING, 3/8 96906 MS35338-46	EVK	EA	40



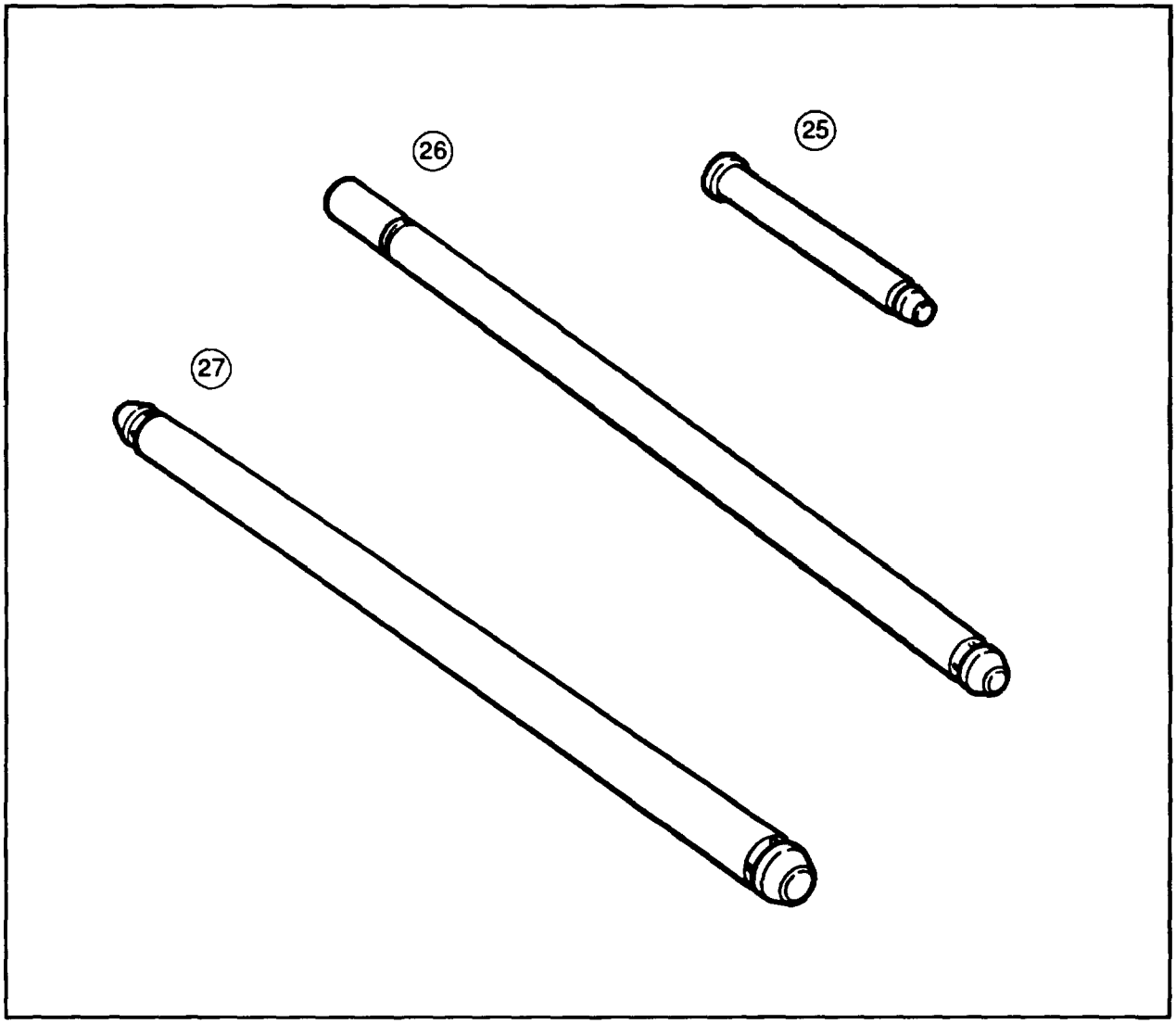
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
17	5420-99-961-2086	PALLET, REAR BUFFER ASSEMBLY: (Trailer) 8 ft 9 in lg K7705 870-03-01-105	EVK	EA	5
18	5420-00-296-9480	STRAP, WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Trailer) 21 - 1/2 ft lg, 1.72 in w, 5,000 lb capacity 97403 13219E3029-1	EVK	EA	20
19	5420-00-296-9499	STRAP, WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Trailer) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVK	EA	45
20	1670-00-545-9062	TIE-DOWN, CARGO: (Trailer) 10,000 lb capacity 81349 MIL-T-25959	EVK	EA	10



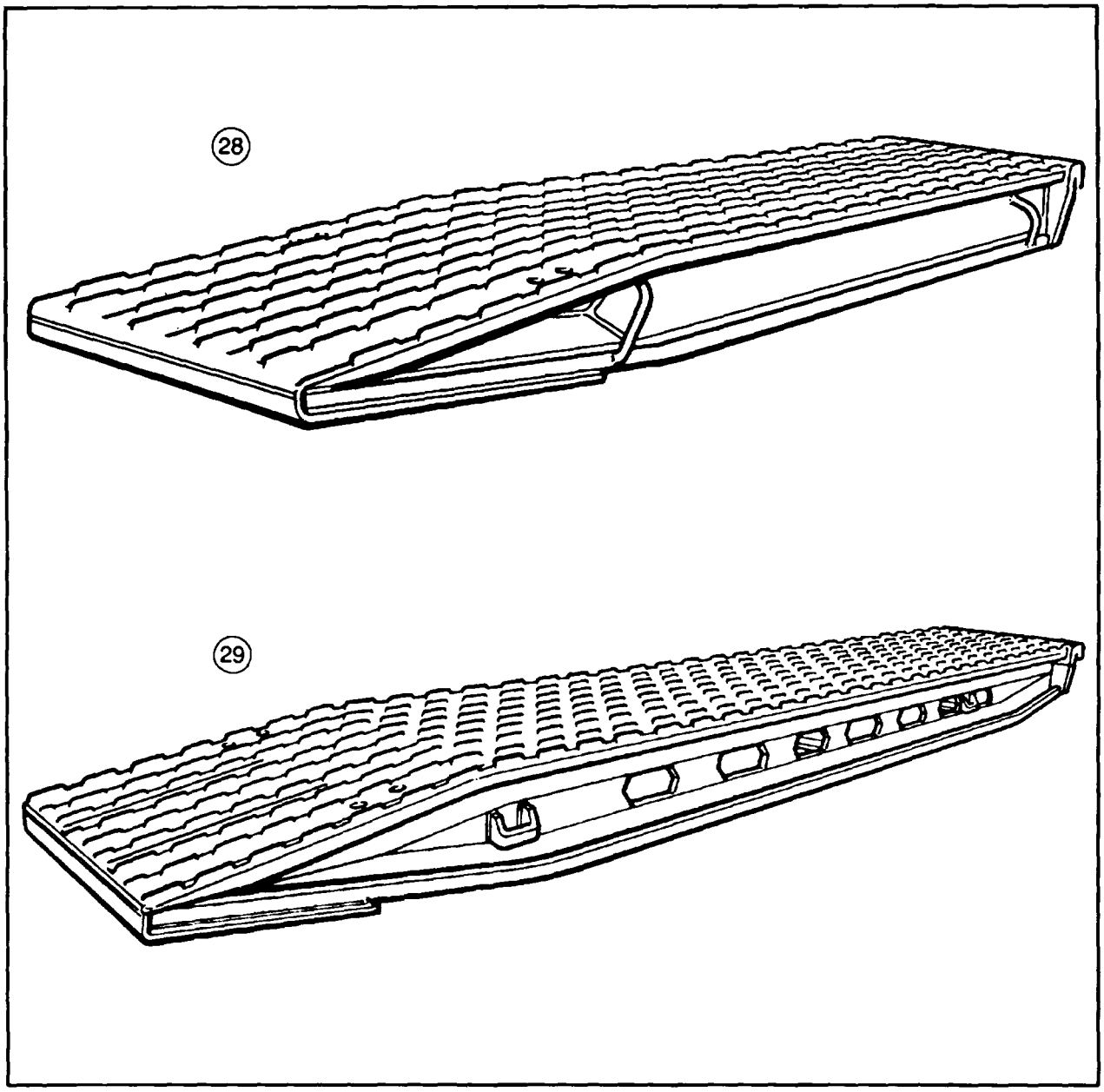
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
21	5420-99-792-3348	PANEL, BOTTOM: 6 ft 5 in lg, 27.0 in w, 43 3/8 in h K7705 870-44542	EVK	EA	26
22	5420-99-341-0861	PANEL, END TAPER: 13 ft 2 1/2in lg, 28.0 in w, 17 3/4in h K7705 870-44540	EVK	EA	5



(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
23	5420-99-793-5001	PANEL, JUNCTION: 3 ft 5 1/4 in lg, 2ft 1 1/2 in w, 15 ft 3 1/4 in h K7705 MEXE 41093	EVK	EA	5
24	5420-99-793-5005	PANEL, TOP: 6 ft 4 in lg, 25 3/ in w, 21 5/8 in h O/A K7705 870-41090	EVK	EA	34

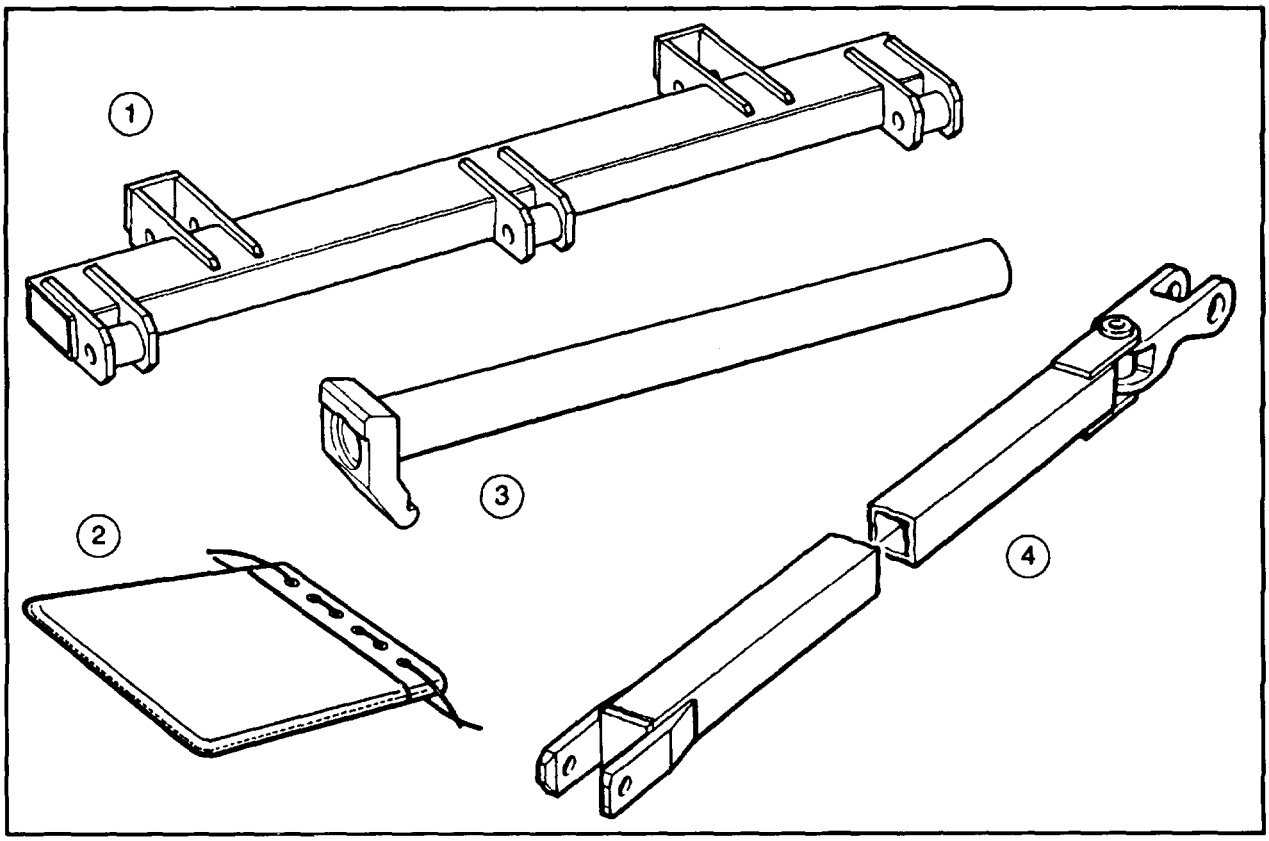


(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
25	5420-99-931-8717	PIN BRACING: Steel alloy, 7 1/4 in lg,1 in dia. K7705 870-44574	EVK	EA	68
26	5420-99-931-8719	PIN, PANEL: Steel alloy, 28 1/4 in lg, 1 3/4in dia K7705 870-44573	EVK	EA	92
27	5420-99-931-8522	PIN, PANEL, HEADLESS: Steel alloy, 29 in lg, 1 3/4 in dia. K7705 870-44572	EVK	EA	5

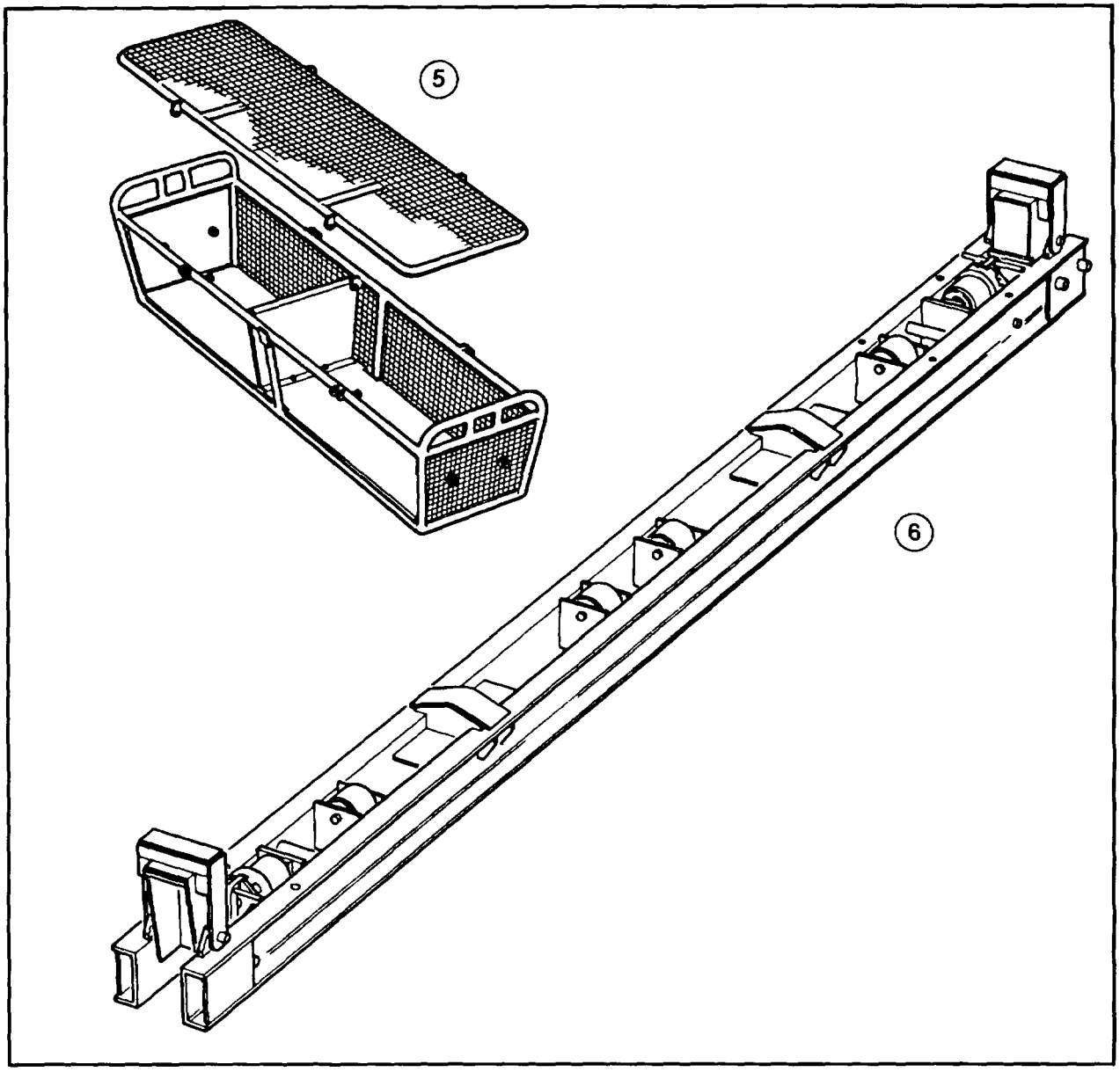


(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
28	5420-99-793-4997	RAMP UNIT, BRIDGE: 10 ft 1/2 in lg, 22 3/ in w K7705 870-41064	EVK	EA	29
29	5420-99-793-5002	RAMP UNIT, SPECIAL: 14 ft 1/2 in lg, 22 3/8 in w K7705 MEXE 41094	EVK	EA	15

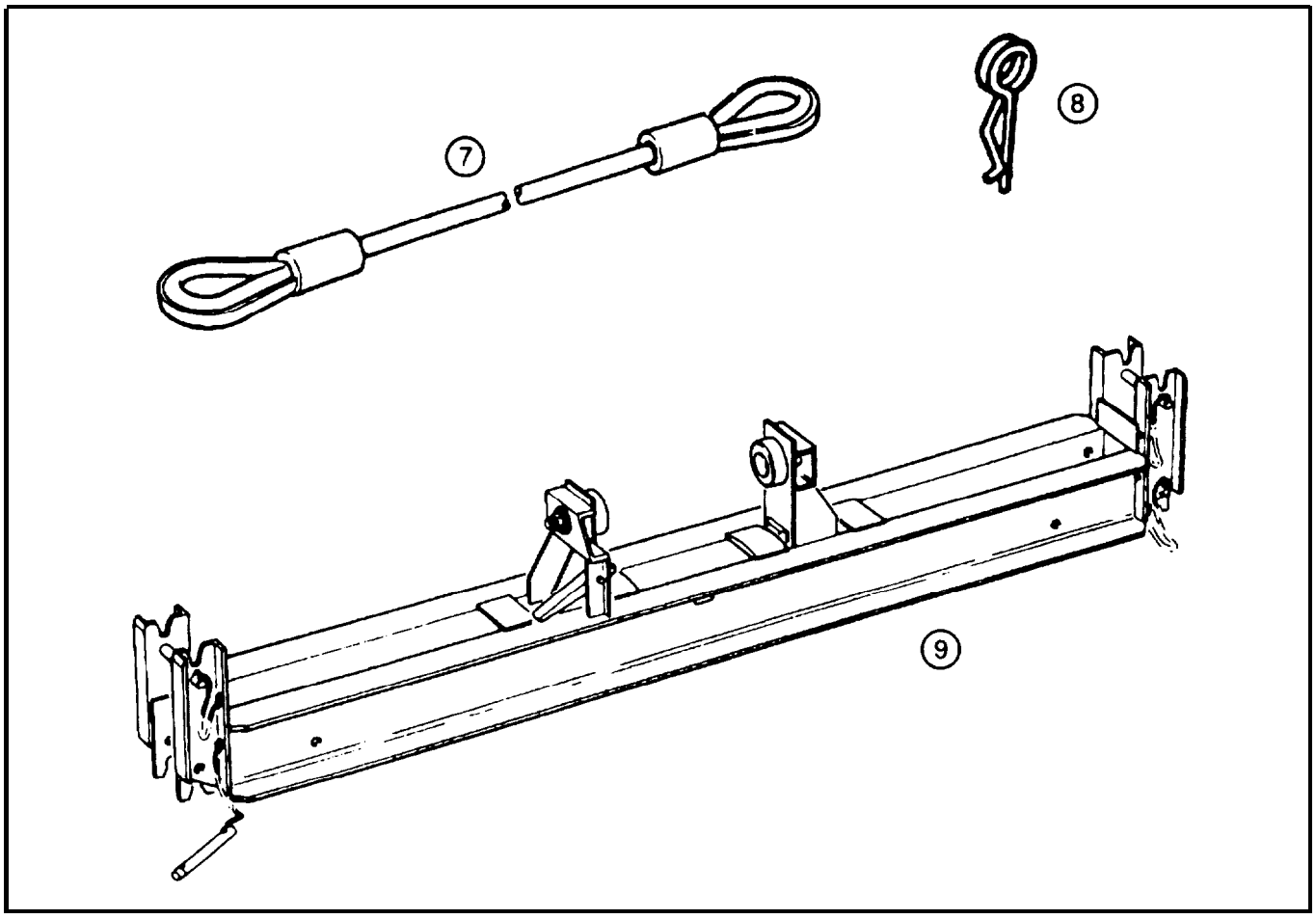
B-5 ERECTION SET



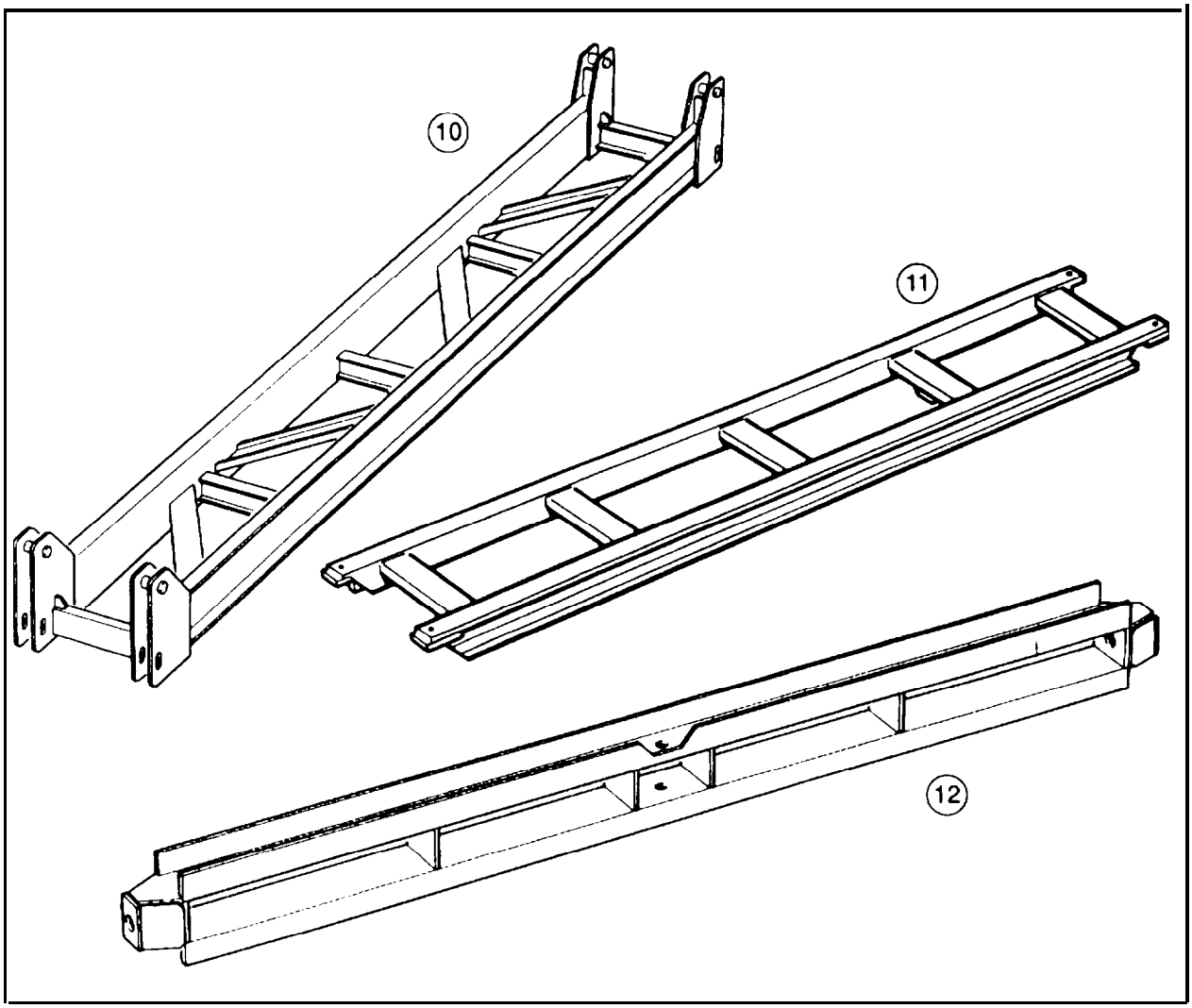
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
1	5420-99-793-5006	ADAPTER ASSEMBLY, PUSH BAR 4 ft 3 in g , 12 3/4 in w, 3 1/4 in h K7705 870-44528	EVL	EA	2
2	5420-99-935-7371	BAG, BRIDGING EQUIPMENT: Cloth, duck, cotton, 14 in lg, 10 in w K7705 870-44567	EVL	EA	2
3	5420-99-641-8684	BAR, CARRYING: 28 1/2 in lg, 1 3/4 in dia. K7705 870-44555	EVL	EA	46
4	5420-99-438-9503	PUSH, BAR, SHORT, LAUNCHING 10 ft 7 1/4in lg, 4 in sq. K7705 870-44562	EVL	EA	2



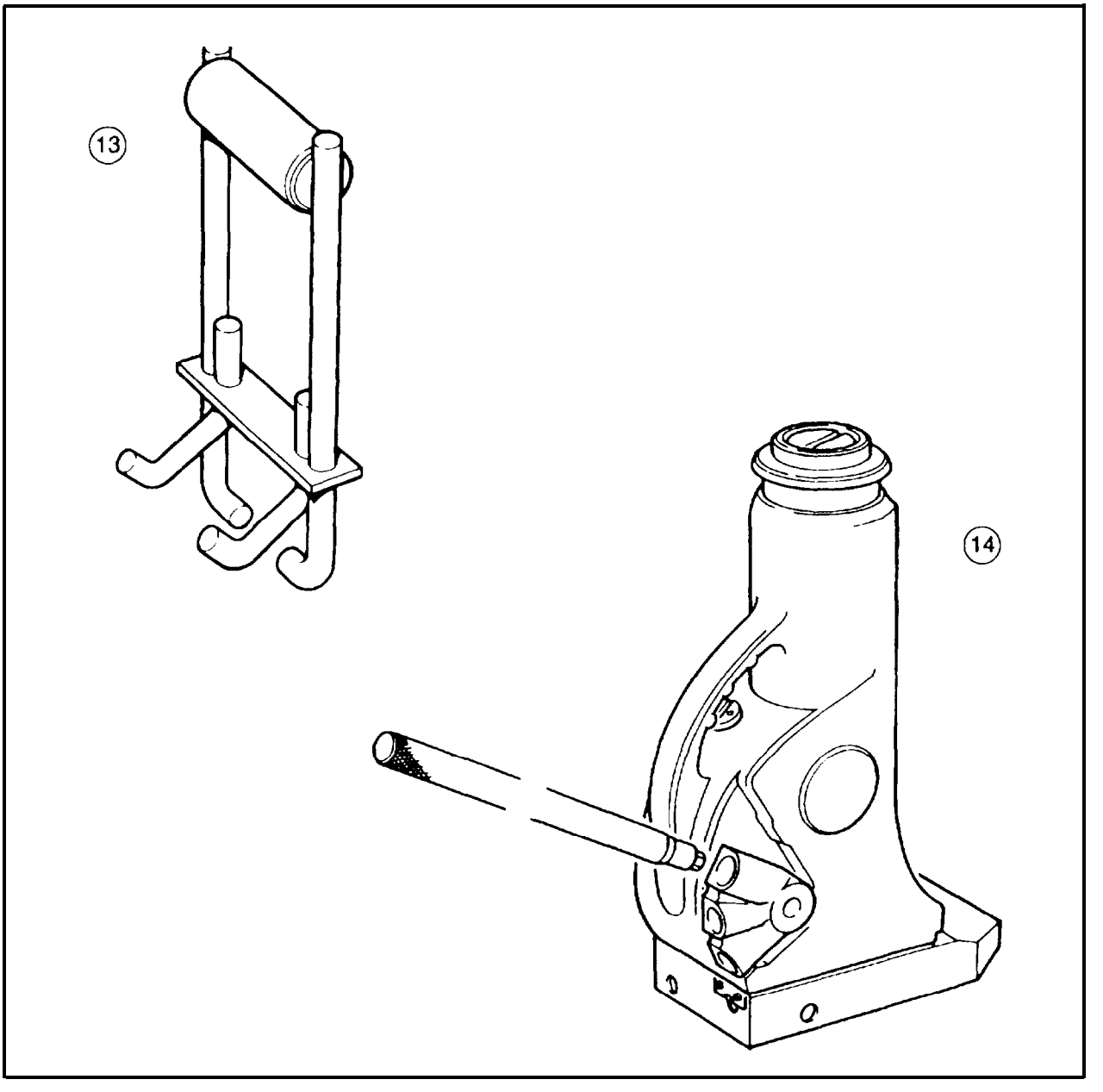
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
5	5420-99-257-3225	BASKET, BRIDGING EQUIPMENT 4 ft 9 in lg, 15 in w, 12 in deep K7705 870-44566	EVL	EA	6
6	5420-99-568-5432	BEAM, ROLLER: 15 ft 5 1/2 in lg, 18 in h K7705 870-44548	EVL	EA	4



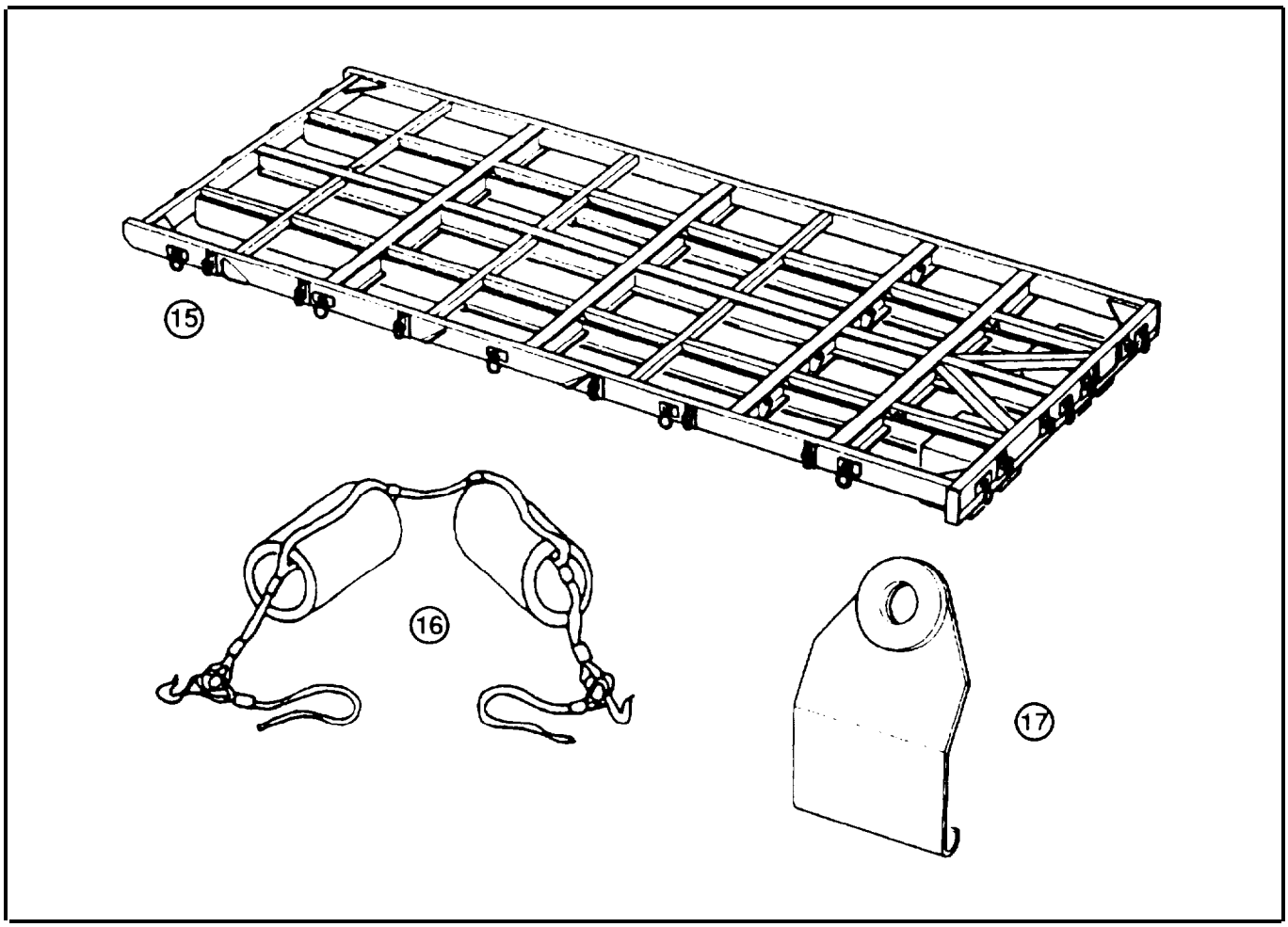
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
7	4010-99-793-5007	EXTRACTOR CABLE ASSEMBLY, SINGLE LEG: Steel wire rope, 20 ft lg K7705 870-41096	EVL	EA	1
8	5420-99-931-6653	CLIP: Spring steel wire, 4-1/8 in lg, approx 1/8 in dia. K7705 87044576	EVL	EA	56
9	5420-99-902-0993	CROSS GIRDER LAUNCHING NOSE BRIDGE Mk 3: 8 ft 7-1/2 in lg, 10-1/4 in w, 18 in h K7705 870-44547	EVL	EA	1



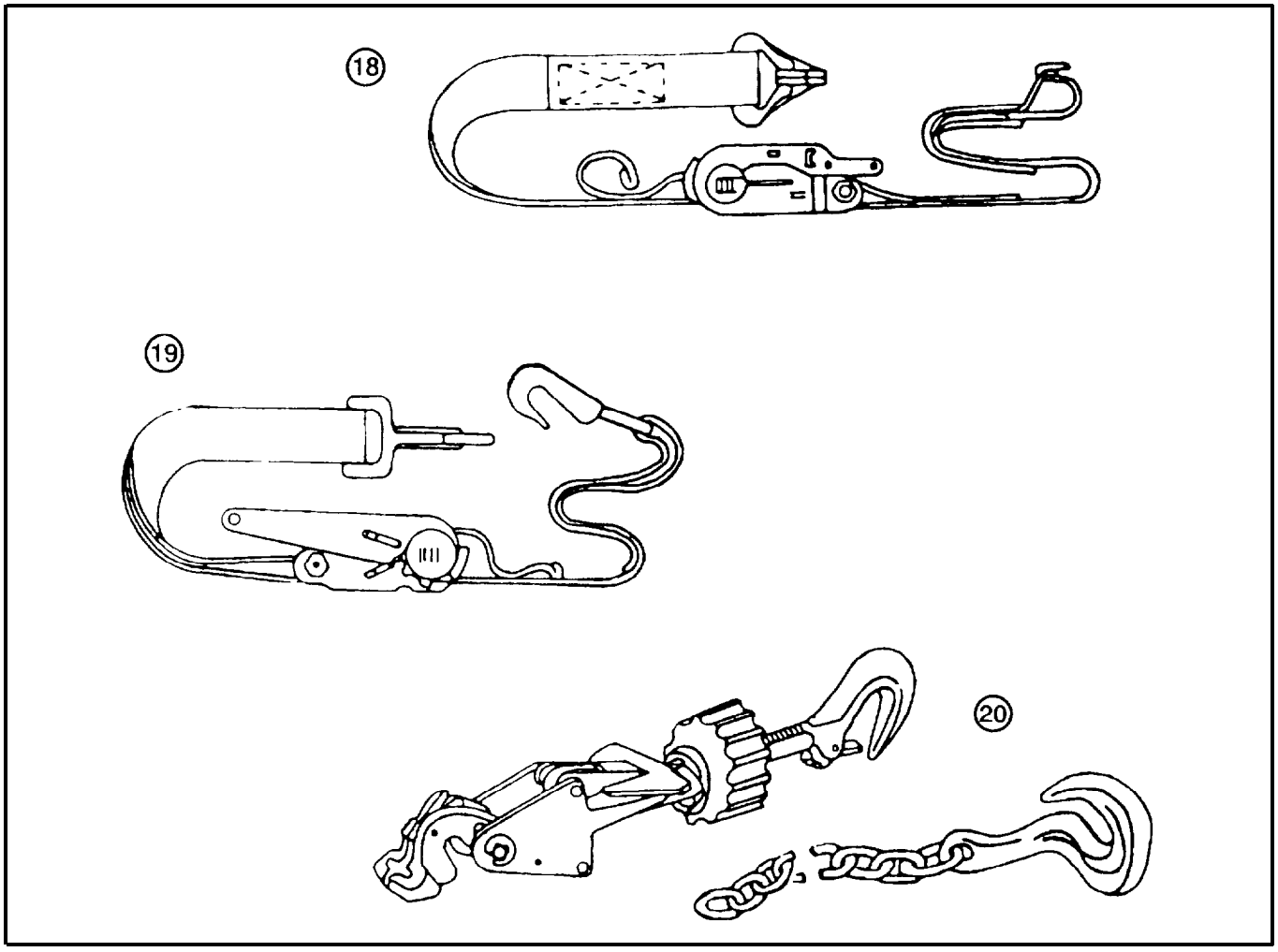
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
10	5420-99-943-6094	CROSS GIRDER BUILDING FRAME: 14 ft 3 1/4, in lg, 20 in w, 15 1/2 in h K7705 870-44546	EVL	EA	3
11	5420-99-888-3183	LONGITUDINAL, GIRDER BUILD -ING FRAME: 14 ft 4 1/2 in lg K7705 870-44568	EVL	EA	3
12	5420-99-392-9079	CROSS GIRDER PUSH, BAR: 9 ft 3 1/4 in lg, 10 1/8 in w, 6 in h K7705 87044549	EVL	EA	2



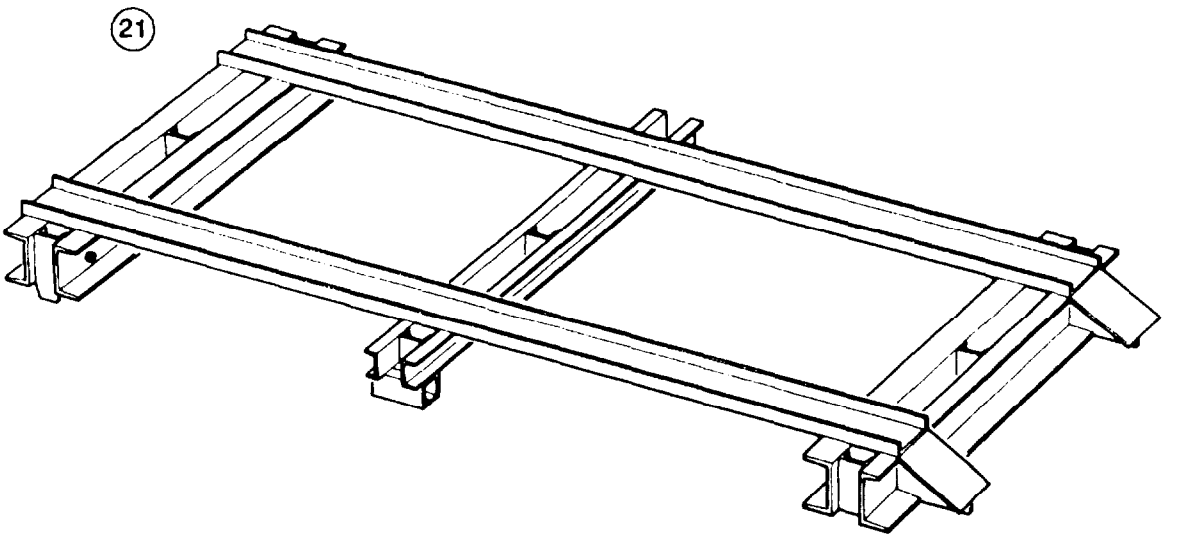
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5)
13	5420-99-501-1250	CARRYING, HANDLE: 12 3/8 in lg, 5 1/2 in w K7705 870-44557	EVL	EA	46
14	5420-99-663-4230	JACK, HYDRAULIC, 15 TON: 5 in w, 19 in h, 32 in extended K7705 870-44570	EVL	EA	7



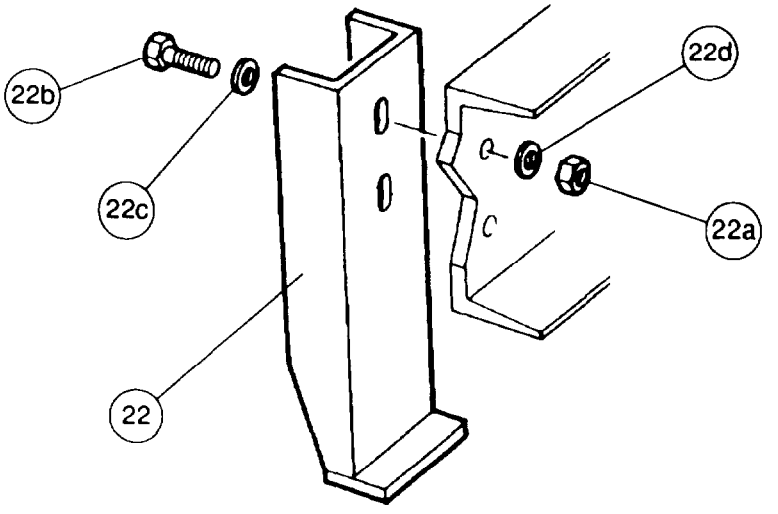
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
15	5420-99-660-0974	PALLET ASSEMBLY: 14 ft 3 in lg, 6 ft 9-1/4 in w, 12 in h K7705 870-03-01-101	EVL	EA	3
16	5420-99-961-2086	PALLET, REAR BUFFER ASSEMBLY: 8 ft 9 in lg (Truck) K7705 870-03-01-105	EVL	EA	2
17	5420-99-793-5889	LUG, TIE-DOWN: (Truck) Steel, 4 in w, K7705 870-03-01-909	EVL	EA	16



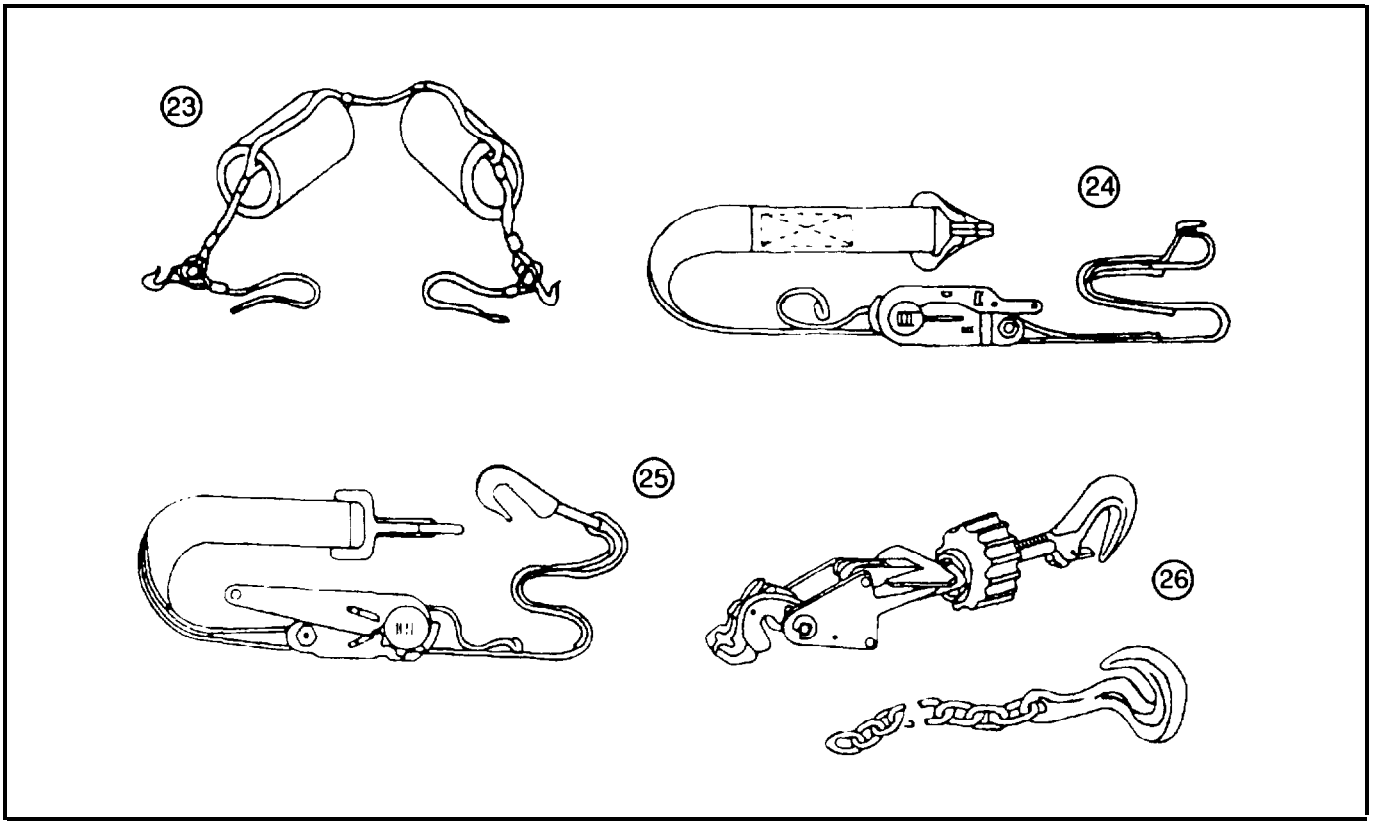
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
18	5420-00-296-9480	STRAP WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Truck) 21 - 1/2 ft lg. 1.72 in w, 5,000 lb capacity 97403 13219E3029-1	EVL	EA	8
19	5420-00-296-9499	STRAP WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Truck) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVL	EA	18
20	1670-00-545-9062	TIE-DOWN, CARGO: (Truck) 10,000 lb capacity 81349 MIL-T-25959	EVL	EA	4



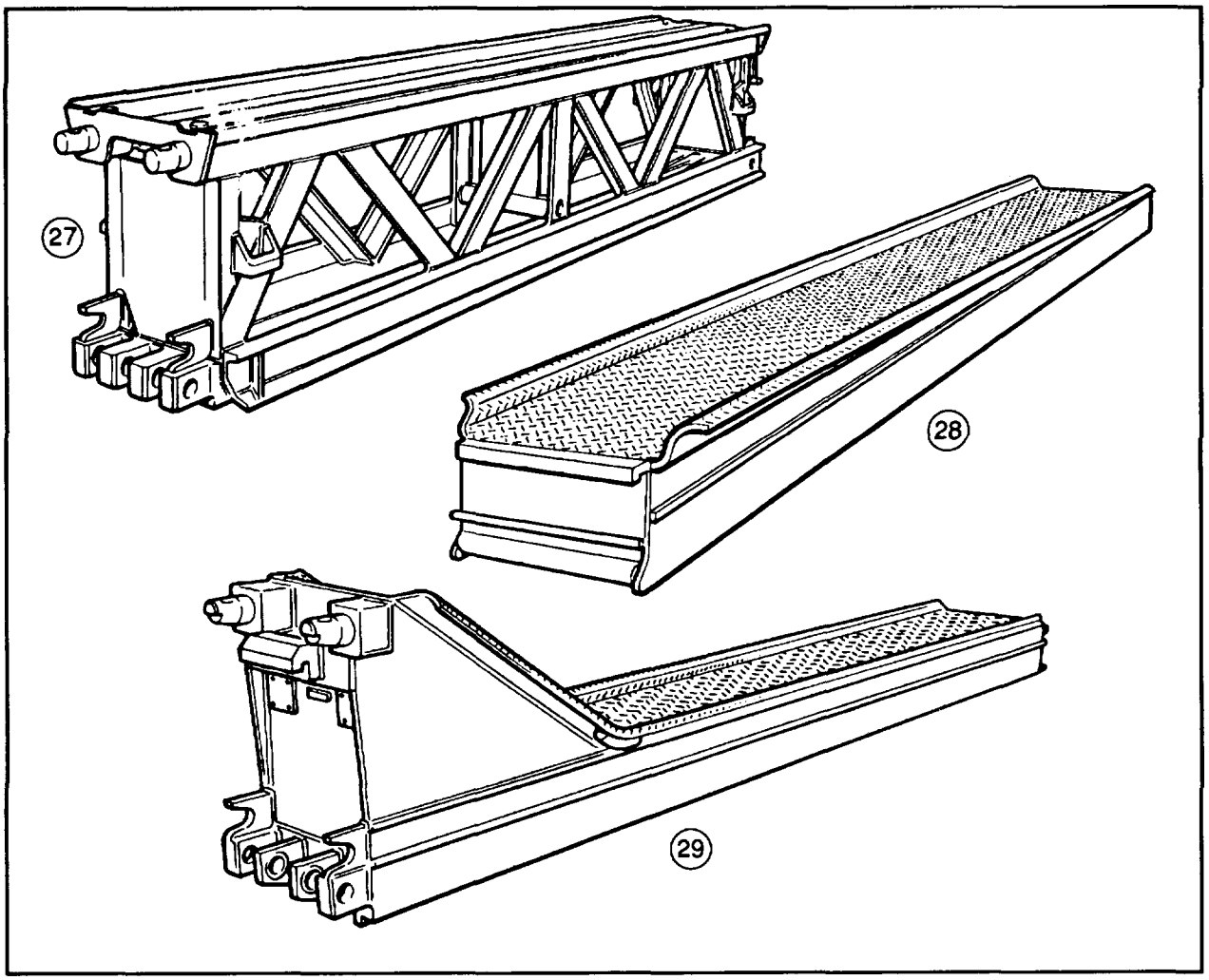
(1) Illus umber	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
21	5420-99-411-3934	ADAPTER ASSEMBLY: Steel, 9 ft 1 in lg, 4 ft 10 in w, 10 in h K7705 870-03-01-106	EVL	EA	1



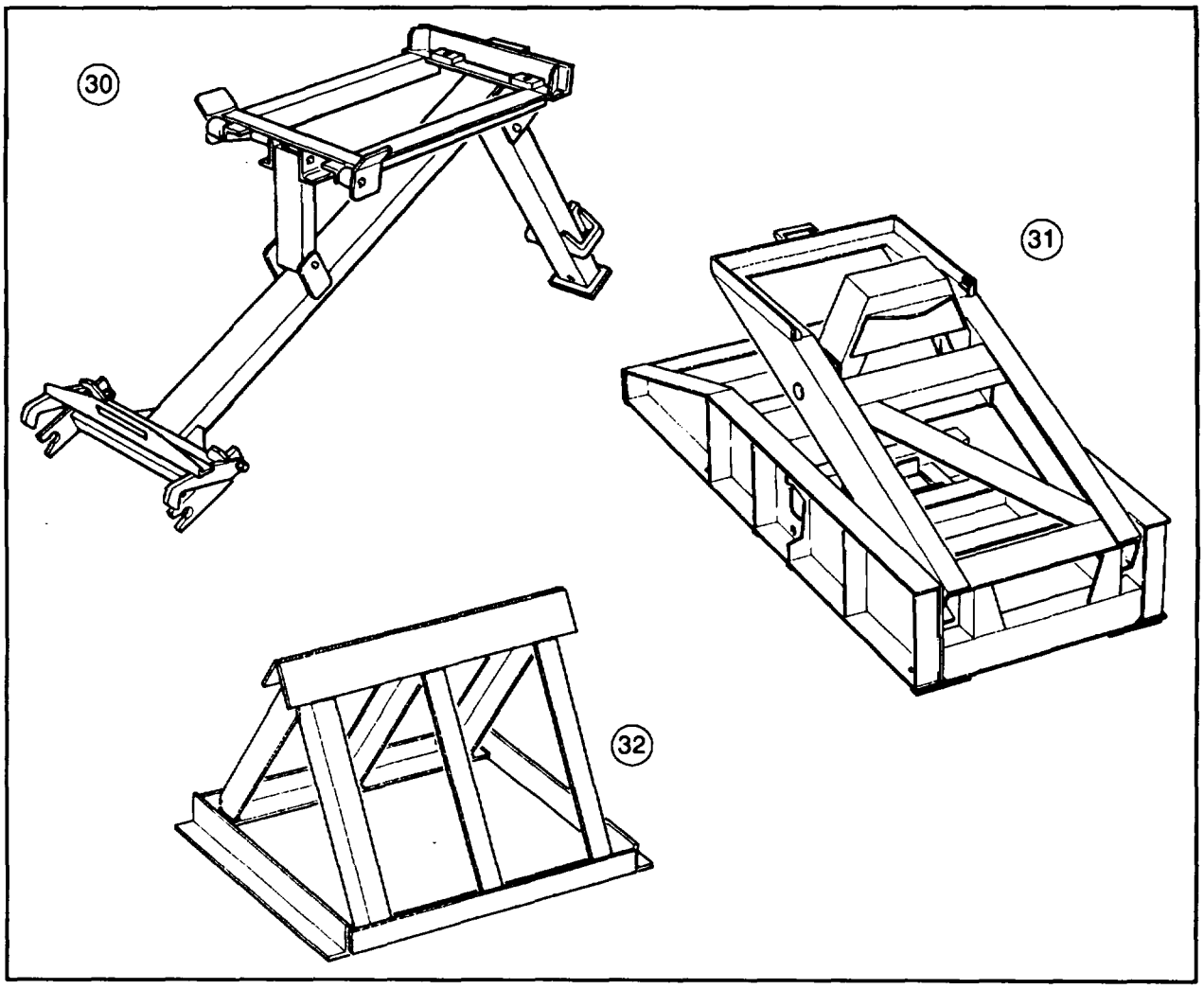
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
22	5420-99-051-3696	BRACKET, ADAPTER: K7705 870-03-01-911 consisting of :	EVK	EA	4
22a	5310-00-732-0558	NUT HEX: Plain, 3/8 - 16 UNC, 96906 MS51967-8	EVK	EA	8
22b	5305-00-725-2317	BOLT HEX HD: 3/8 - 16 UNC, 1 1/2 in lg, steel 96906 MS90728-64	EVK	EA	8
22c	5310-00-080-6004	WASHER FLAT, 3/8 HEAVY: Steel, 96906 MS27183-14	EVK	EA	8
22d	5310-00-637-9541	WASHER, SPRING, 3/8 96906 MS3533846	EVK	EA	8



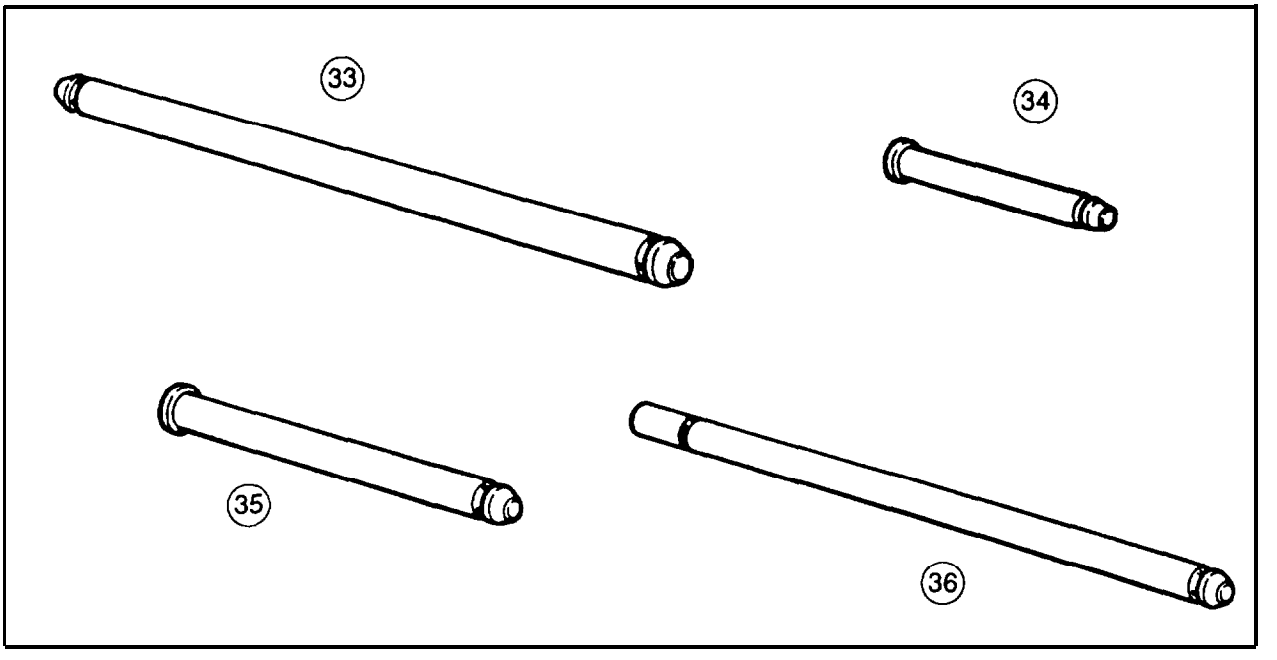
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
23	5420-99-961-2086	PALLET, REAR BUFFER ASSEMBLY: 8 ft 9 in lg (Trailer) K7705 870-03-01-105	EVM	EA	1
24		STRAP, WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Trailer) 21 - 1/2 ft lg, 1.72 in w, 5,000 lb capacity 97403 13219E3029-1	EVM	EA	4
25		STRAP, WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Trailer) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVM	EA	9
26	1670-00-545-9062	TIE-DOWN, CARGO: (Trailer) 10,000 lb capacity 81349 MIL-T-25959	EVM	EA	2



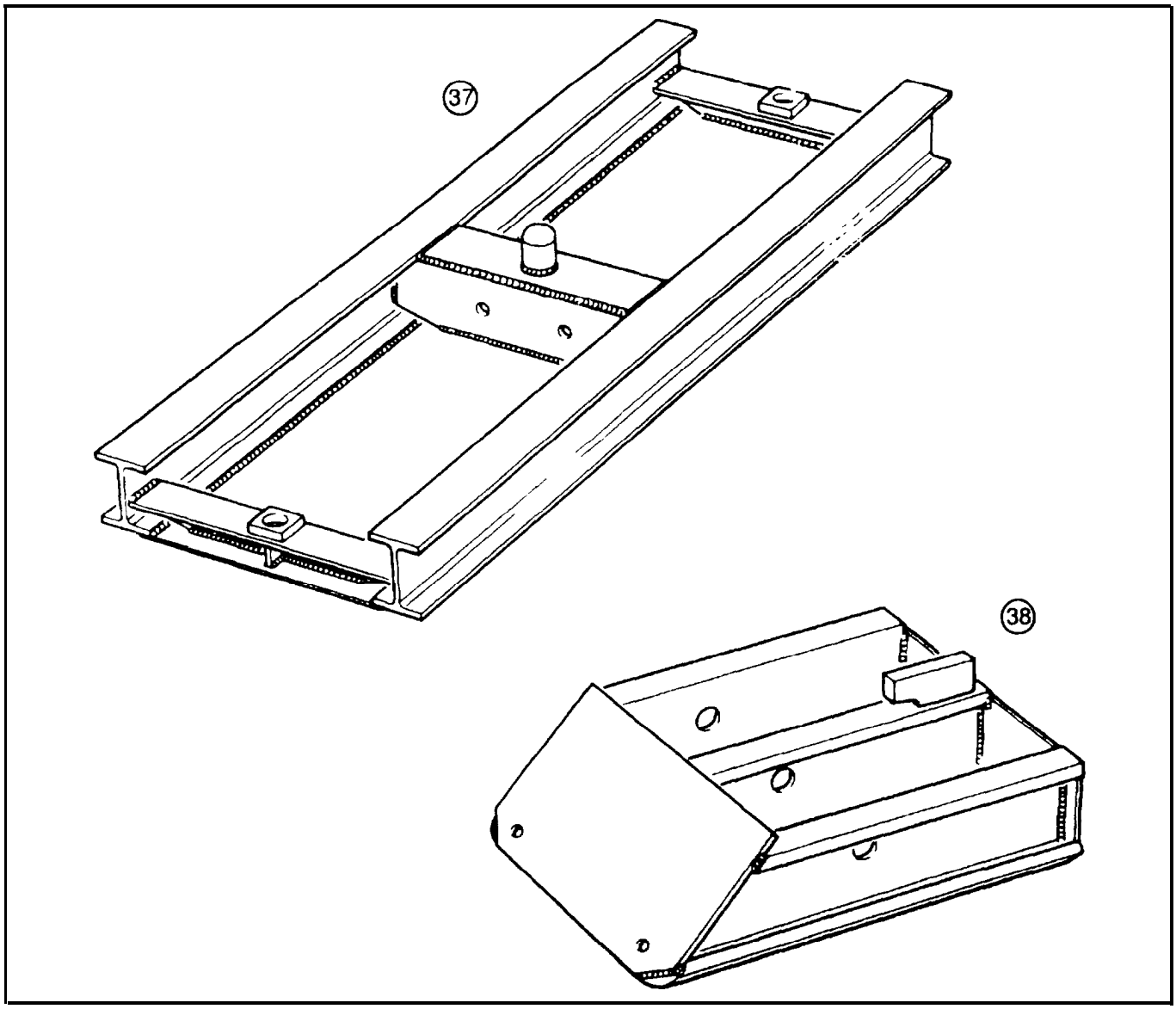
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
27	5420-99-894-0468	LAUNCHING NOSE UNIT, HEAVY: 10 ft 5 in lg, 18 in w, 24 in h K7705 870-44559	EVL	EA	8
28	5420-99-796-5500	LAUNCHING NOSE UNIT, LIGHT, FRONT: 10 ft lg, 13 1/4in w, 8 1/4 in h K7705 870-44554	EVL	EA	5
29	5420-99-670-6032	LAUNCHING NOSE UNIT, LIGHT, REAR: 10 ft 5 in lg, 13 ¼ in w, 24 in h K7705 870-44556	EVL	EA	5



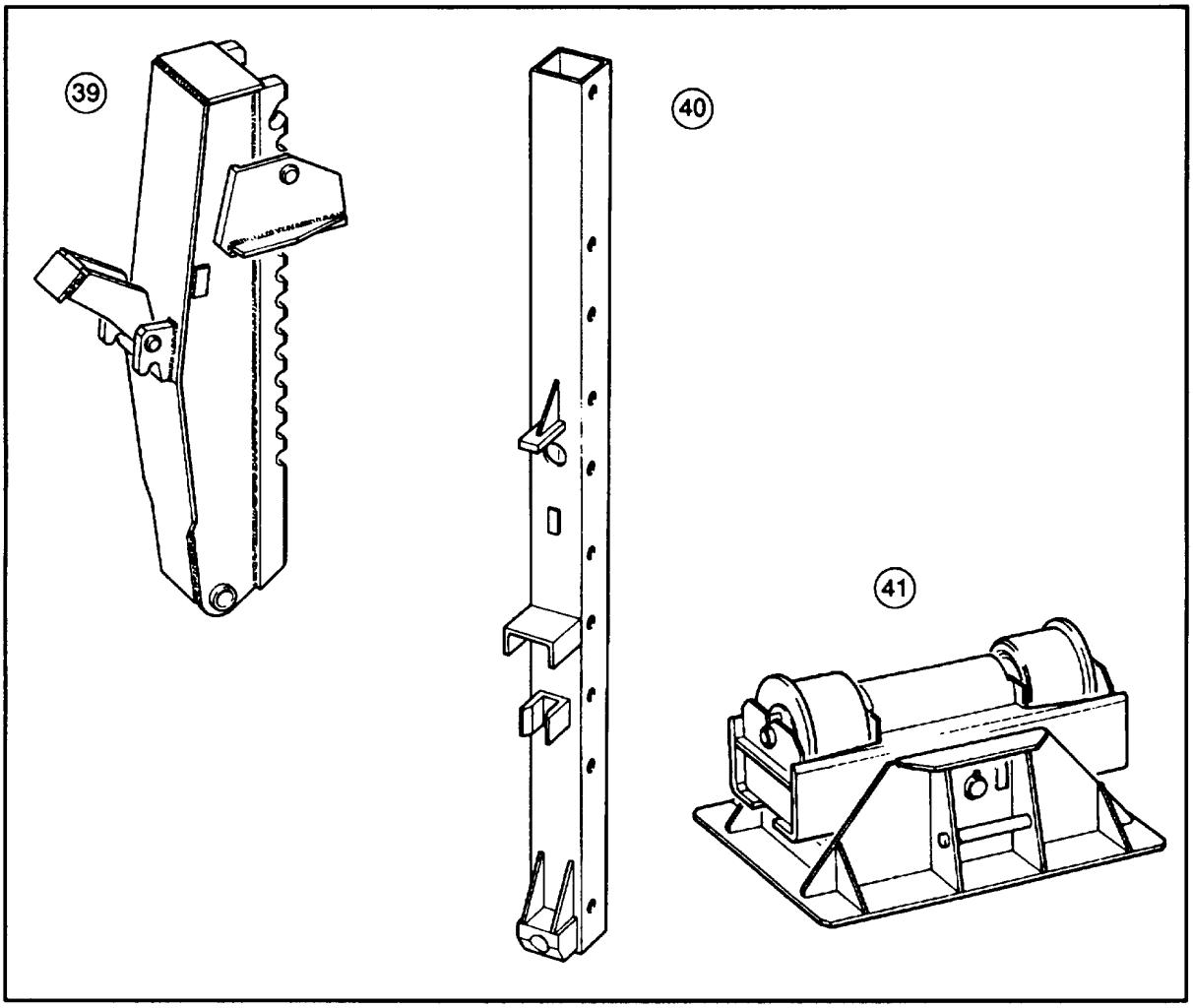
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
30	5420-99-439-6339	PANEL ERECTION AID: 7 ft lg folded, 24 in w, 12 in h K7705 870-44550	EVL	EA	3
31	5420-99-432-0125	PEDESTAL LANDING ROLLER, ADJUSTABLE Mk 1: 5 ft 7 1/2 in lg, 30 in w, 14 1/2 in h K7705 870-44558	EVL	EA	2
32	5420-99-020-6339	PEDESTAL, BUILDING: 24 1/2 in 1g,19 in w, 16 in h K7705 870-44569	EVL	EA	7



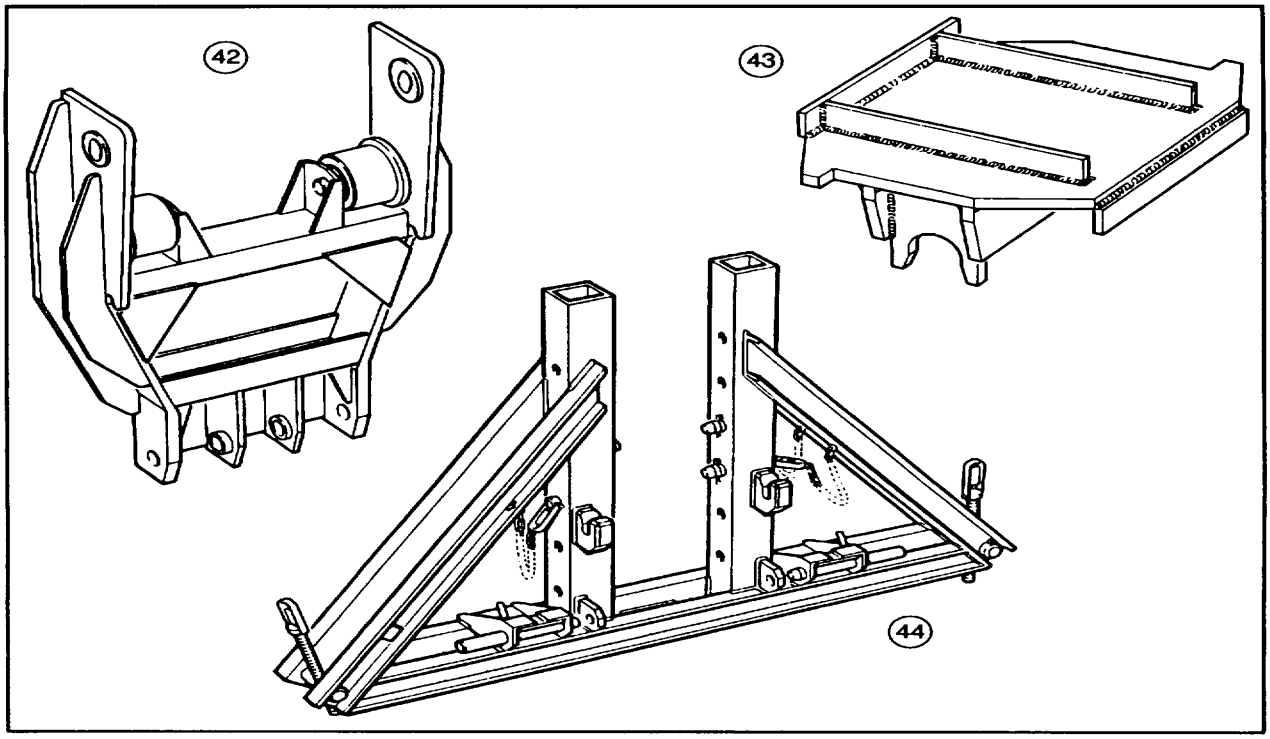
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
33	5420-99-931-8522	PIN, PANEL, HEADLESS: Steel alloy,1 3/4 in dia., 29 in lg K7705 870-44572	EVL	EA	2
34	5420-99-931-8717	PIN, BRACING: Steel alloy, 1 in dia., 7 1/4 in lg K7705 870-44574	EVL	EA	8
35	5420-99-931-8718	PIN, LAUNCHING NOSE: Steel alloy, 17 1/8 in lg, 1 1/4 in dia. K7705 870-44575	EVL	EA	23
36	5420-99-931-8719	PIN, PANEL: Steel alloy, 28 1/4 in lg, 1 3/4 in dia. K7705 870-44573	EVL	EA	20



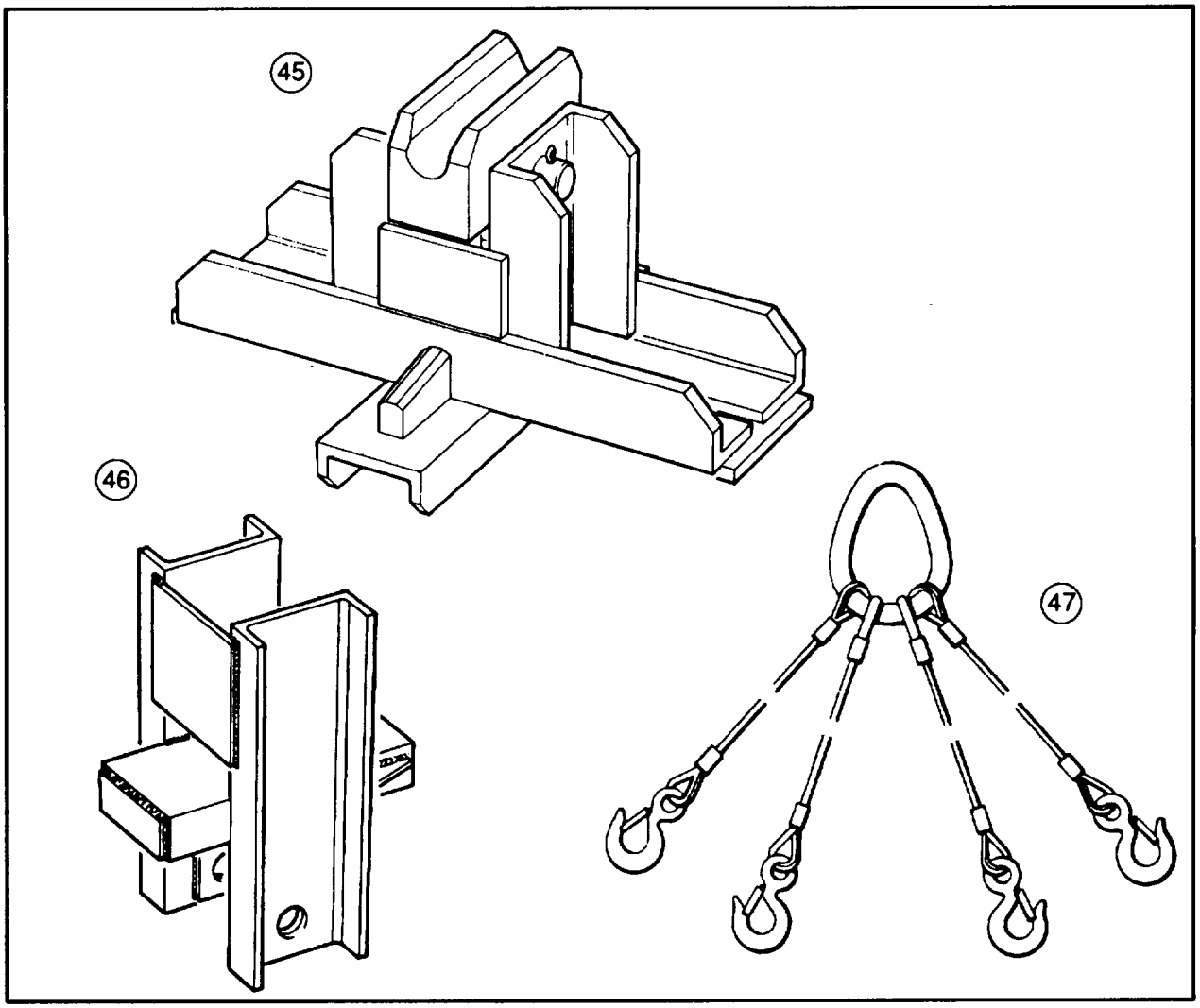
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Oty Reqd
37	5420-99-694-6266	BASEPLATE, BUILDING FRAME: 5 ft 4 in lg, 23 in w, 6-3/4 in h K7705 670-44564	EVL	EA	6
36	5420-99-630-6066	BASEPLATE, ROLLER BEAM, SUPPORT 24-3/6 in lg, 17-1/4 in w, 7-314 in h K7705 670-44545	EVL	EA	2



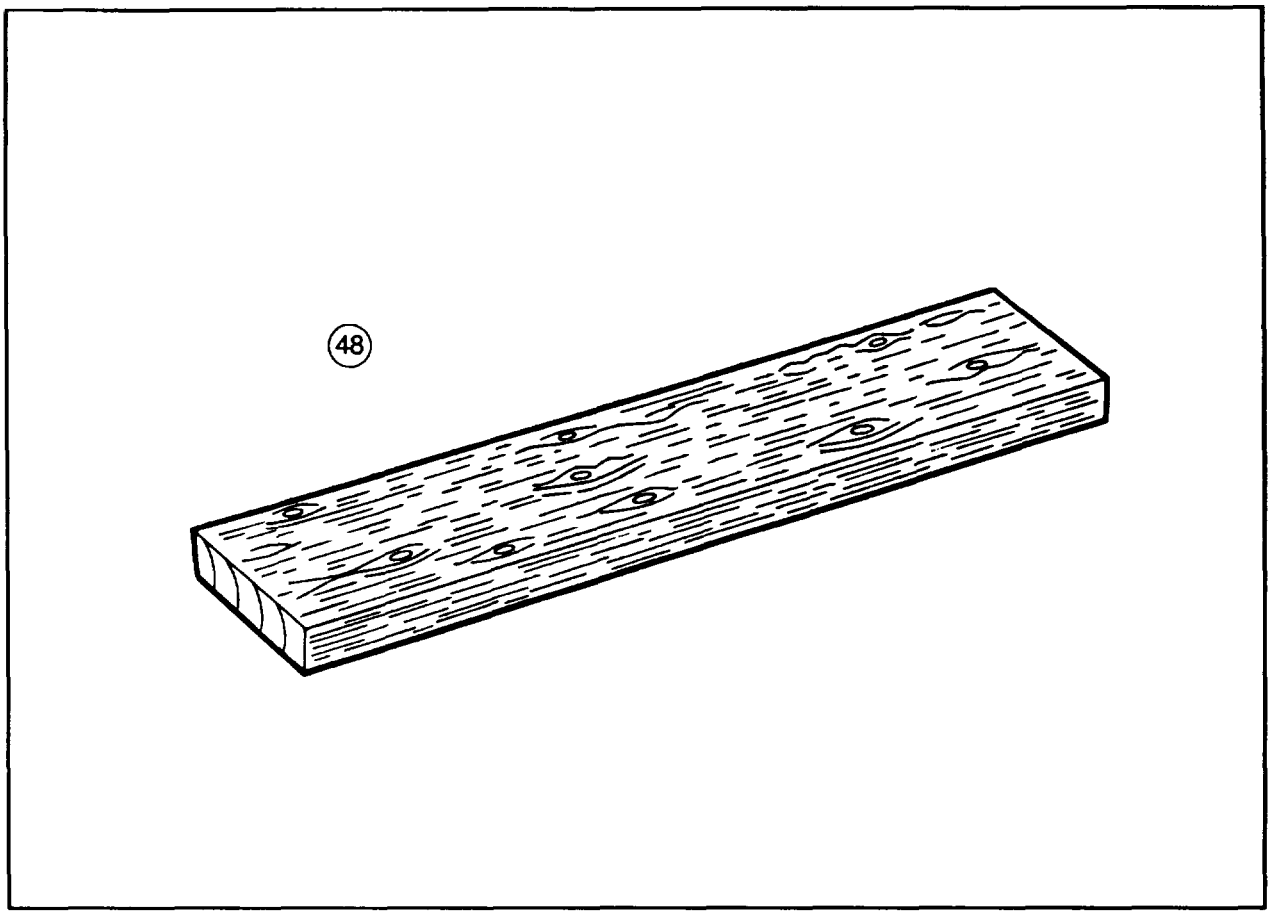
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
39	5420-99-168-6606	POST, JACKING: 34 3/4 in lg, 6 in w K7705 870-44565	EVL	EA	4
40	5420-99-793-5011	POST, LAUNCHING NOSE, CROSS GIRDER: 5 ft 10 in lg, 4 in w, 7 1/4, in h K7705 MEXE 41097	EVL	EA	4
41	5420-99-951-8739	ROLLER, LANDING: 16 in lg, 22 1/2 in w, 11 in h K7705 870-44563	EVL	EA	4



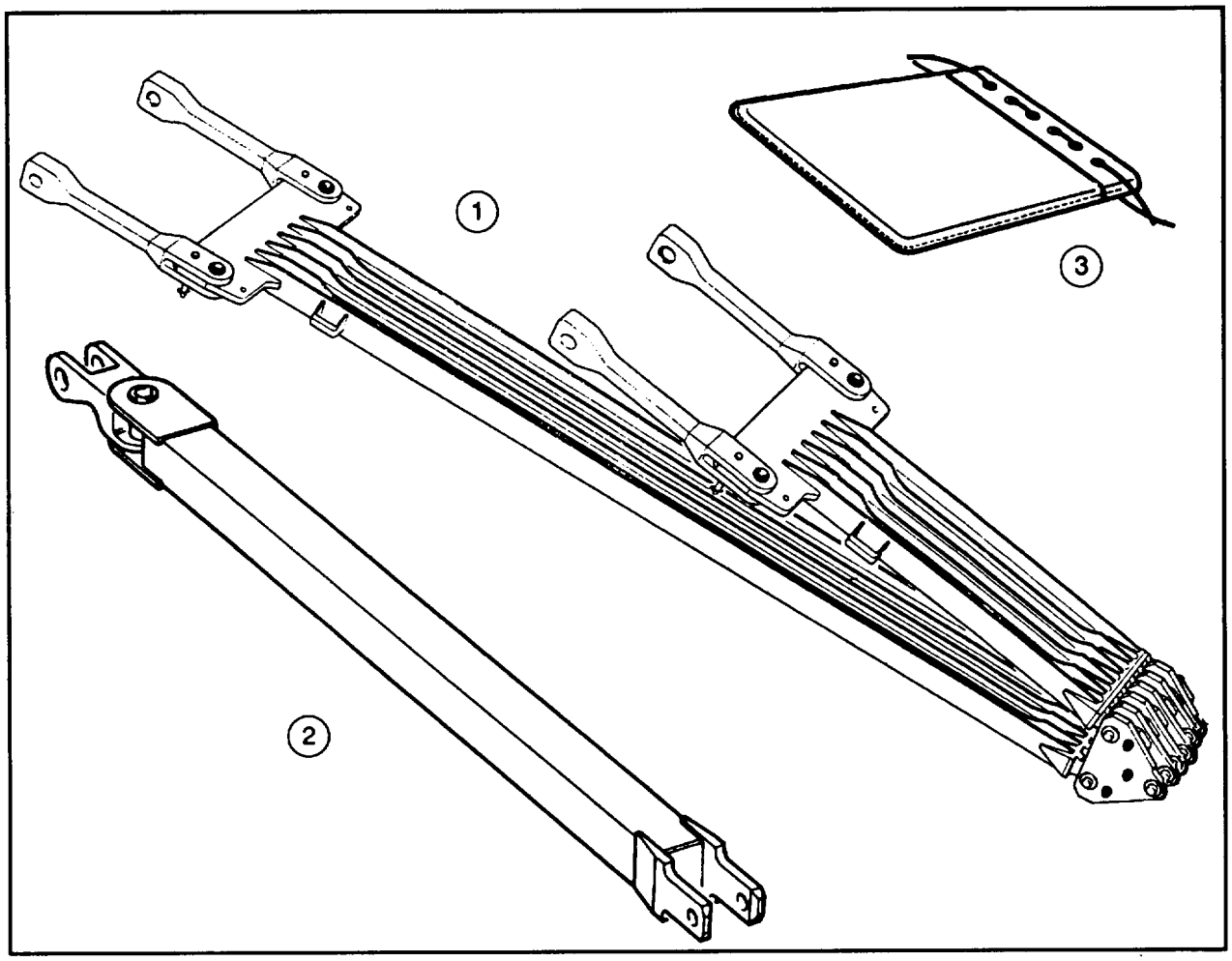
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
42	5420-99-660-0975	ROLLER, LAUNCHING NOSE Mk 2 33 3/4 in lg, 25 in w, 7 in h K7705 870-44543	EVL	EA	2
43	5420-99-549-3254	JACK SEATING, BUILDING FRAME: 12 1/4 in lg, 8 1/2 in w, 5 in h K7705 870-44553	EVL	EA	5
44	5420-99-108-9675	ROLLER BEAM SUPPORT, ADJUSTABLE: 5 ft 5 in lg, 7 in w, 3 ft 8 in h K7705 870-44544	EVL	EA	6



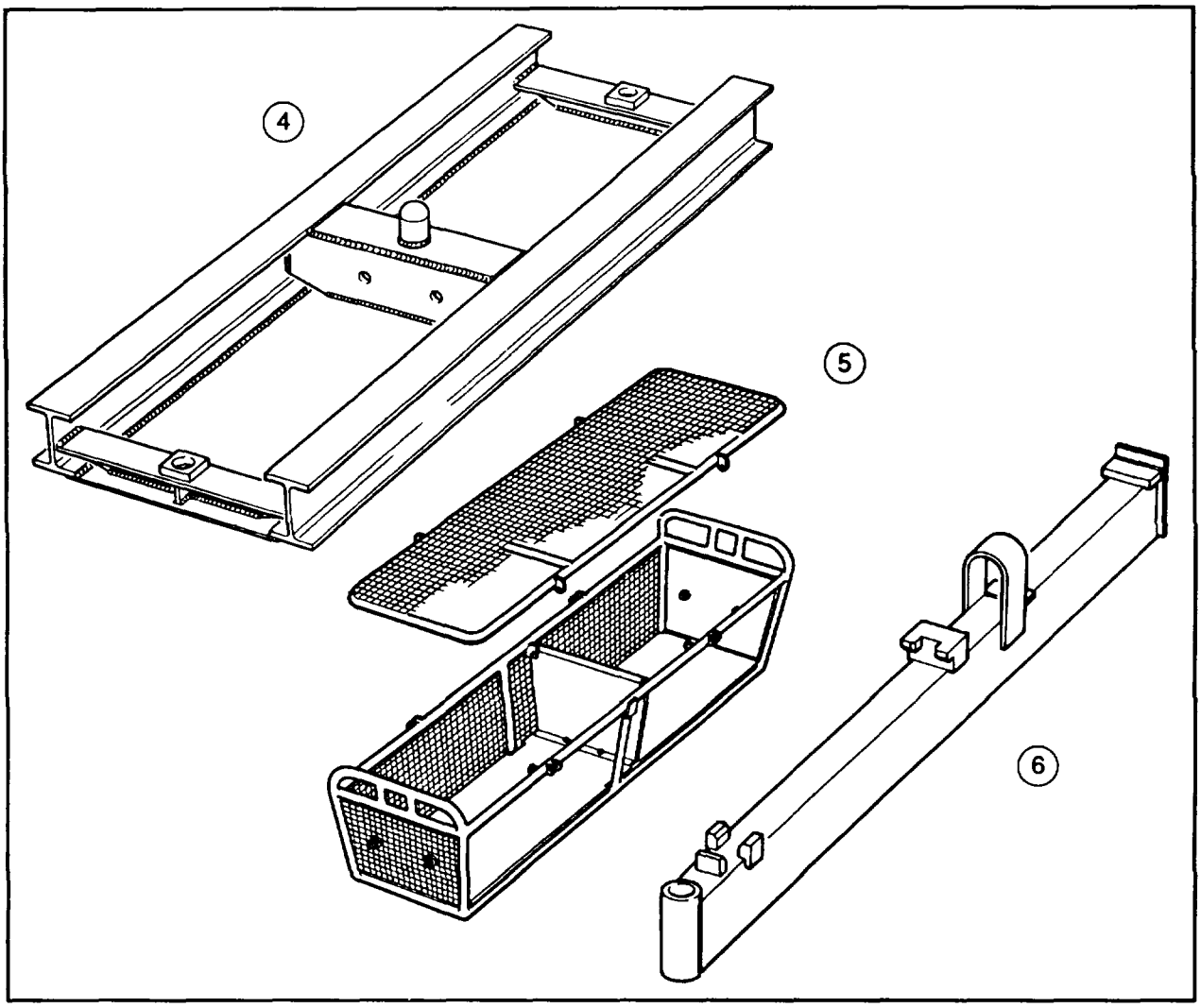
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
45	5420-99-995-9489	ROLLER BEAM SUPPORT, FIXED 16 1/2 in lg, 12 in w, 9 1/2 in h K7705 870-44561	EVL	EA	7
46	5420-99-013-1050	SUPPORT, JACK 15 in lg, 9 in w, 10 1/2in h K7705 870-44552	EVL	EA	5
47	5420-99-793-5013	SLING, MULTIPLE LEG: Steel wire rope, 16 ft lg, pear shape ring, 4 hooks K7705 870-41098	EVL	EA	1



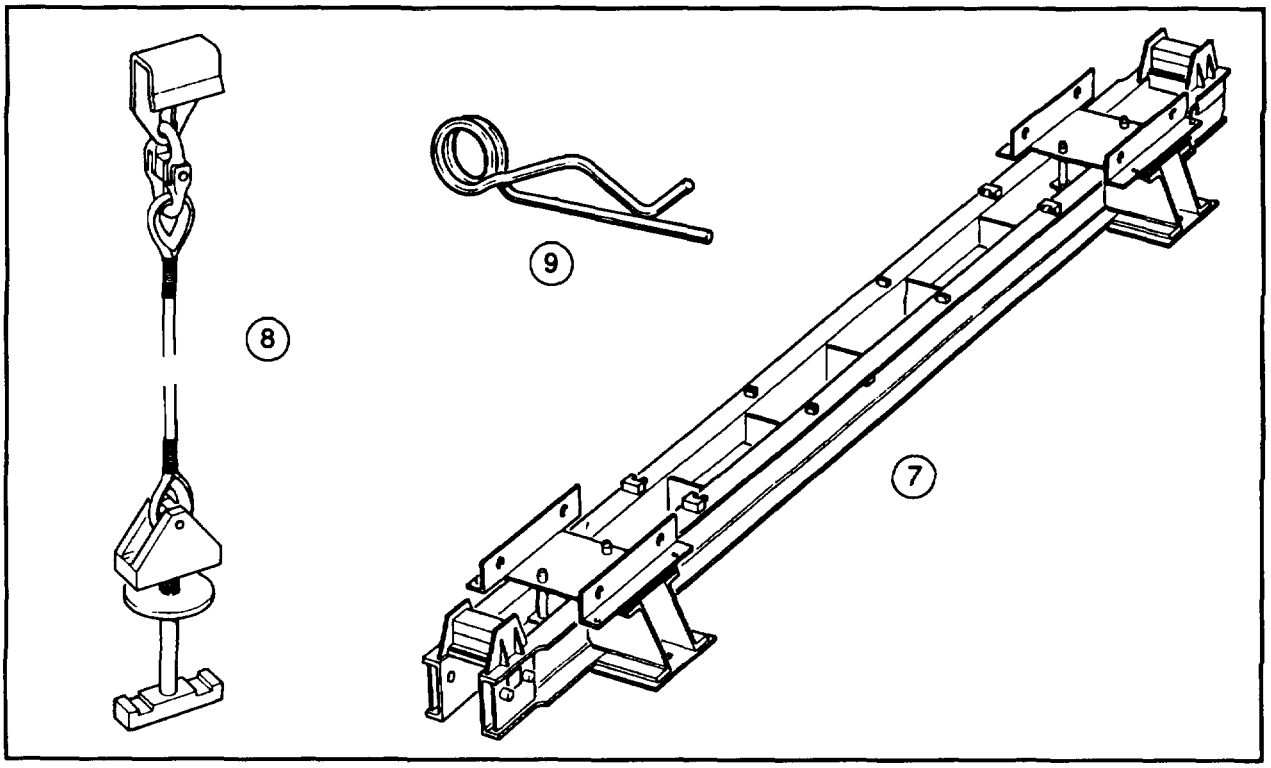
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
48	5420-99-442-3354	TIMBER, PACKING: 8 in x 3 in x 36 in K7705 870-50305	EVL	EA	144



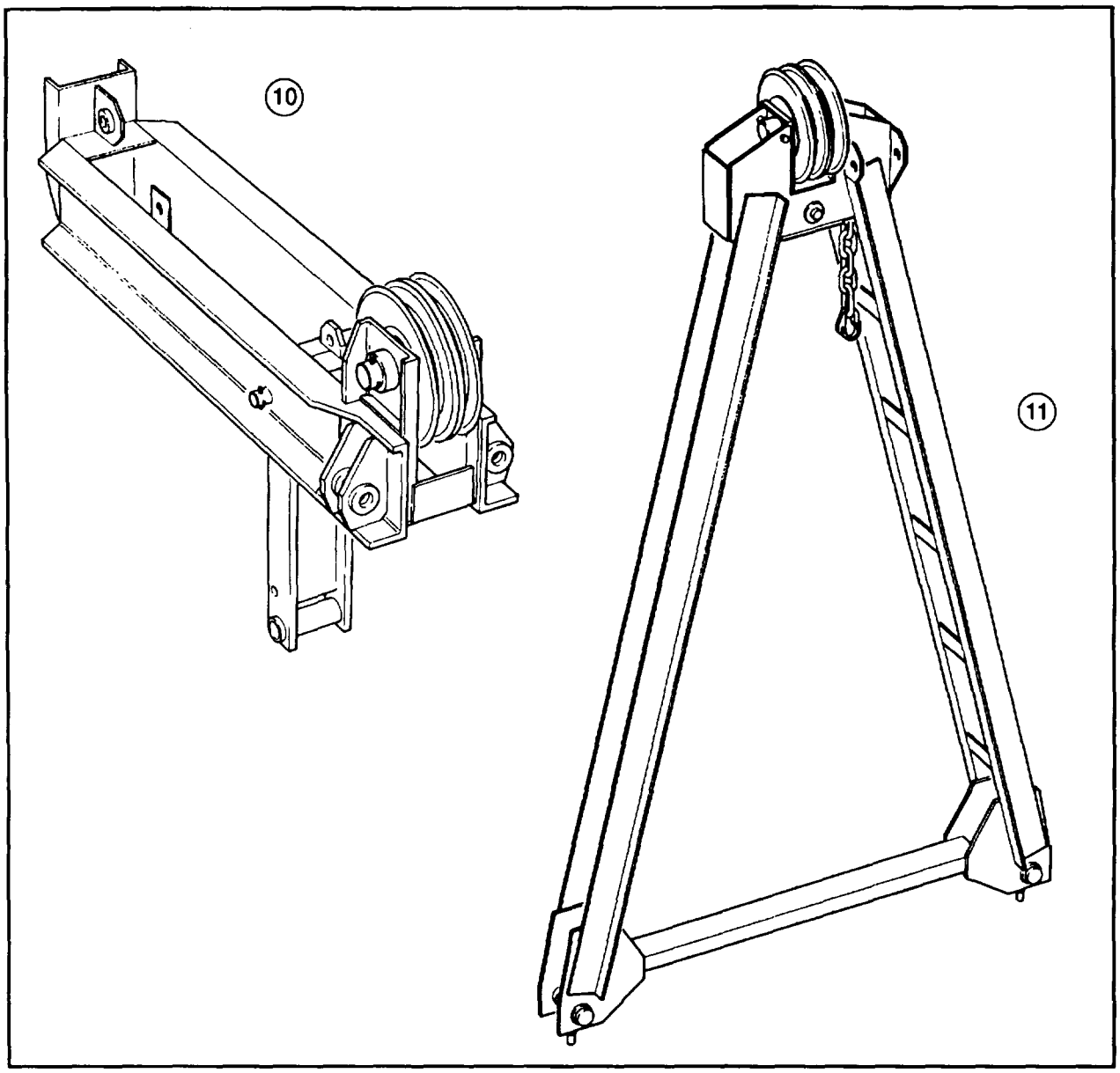
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
1	5420-99-320-0762	ANCHOR PIECE ASSEMBLY: 10 ft 9 1/2 in lg, 2 ft 3 5/8 in w, 11 3/16 in h K7705 870-44594	EVM	EA	5
2	5420-99-517-1203	PUSH, BAR, LONG, LAUNCHING: Steel, 15 ft 8 3/16 in lg, 4 5/8 in w K7705 870-44584	EVM	EA	2
3	5420-99-935-7371	BAG, BRIDGING EQUIPMENT: Cloth, duck, cotton,14 in lg, 10 in w K7705 870-44567	EVM	EA	2



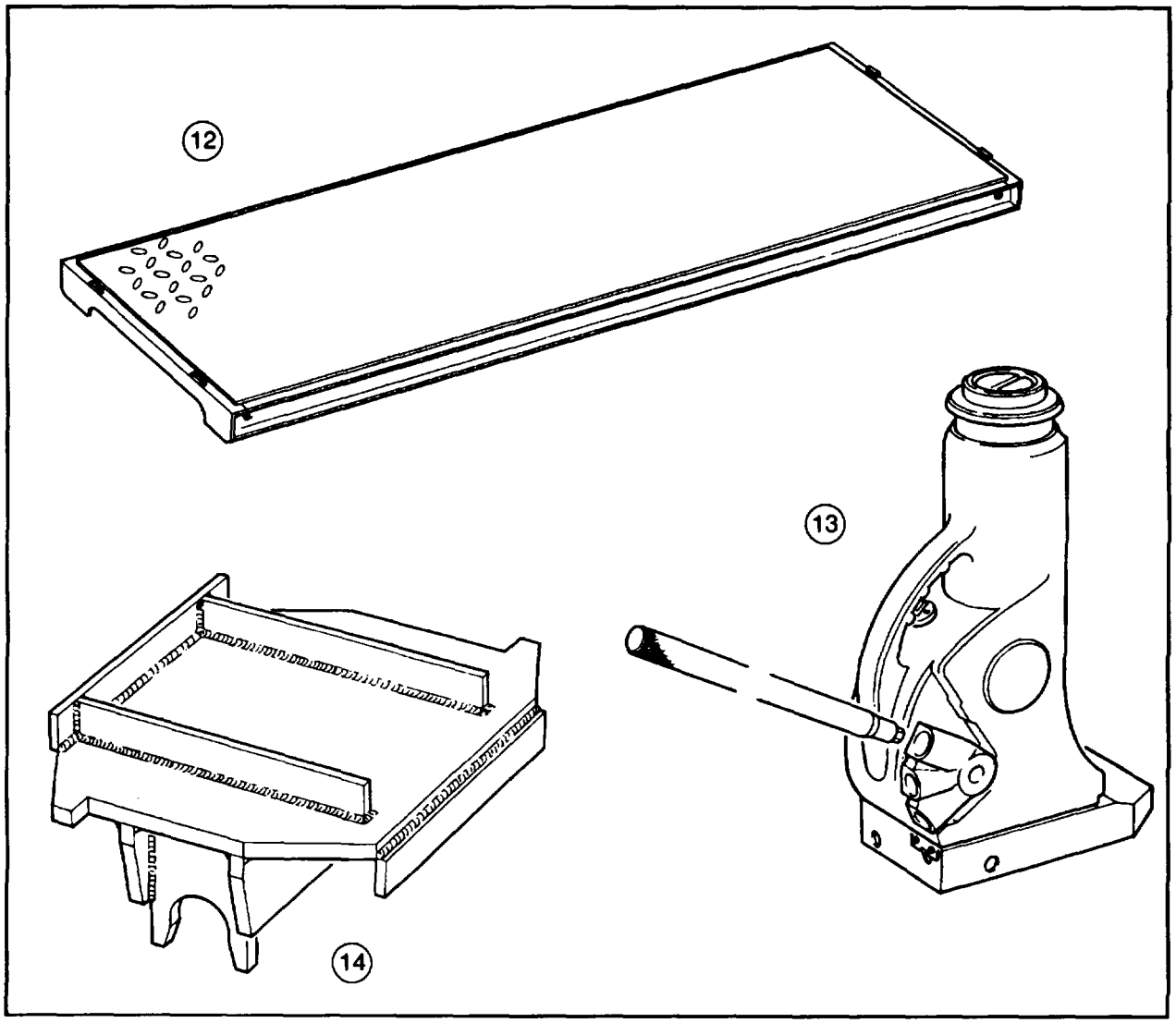
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
4	5420-99-894-8288	BASEPLATE, BUILDING FRAME: 5 ft 4 in lg, 23 in w, 6 3/4 in h K7705 870-44564	EVM	EA	4
5	5420-99-547-3225	BASKET BRIDGING EQUIPMENT: Steel, 4 ft 9 in lg, 15 in w, 12 in deep K7705 870-44566	EVM	EA	4
6	5420-99-977-5473	BEARER, FOOTWALK 5 ft 3/8 in lg, 2 3/4 in w, 7 3/4 in deep K7705 870-44589	EVM	EA	10



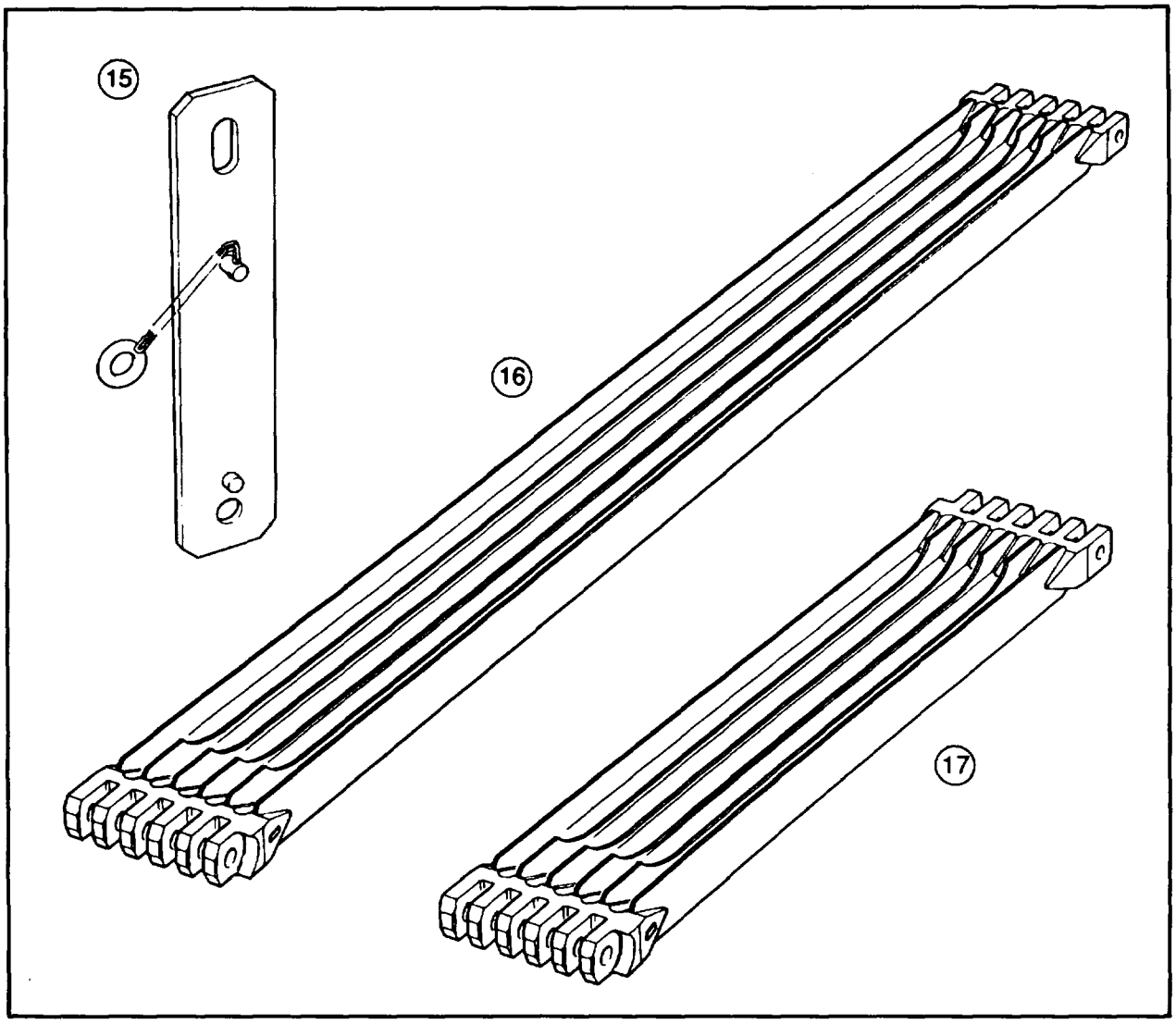
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
7	5420-99-613-9287	CAPSILL, BRIDGING: 15 ft 5 7/16 in lg, 2 ft 6 in w, 14 5/8 in h K7705 870-44591	EVM	EA	2
8	5420-99-215-1643	ANTI-FLUTTER CABLE ASSY: Coupling, toggle bar, rope and hook, 9 ft 10 in lg, Wt 4.4 lb K7705 870-44599	EVM	EA	5
9	5420-99-931-6653	CLIP: Spring wire 4 1/8 in lg, approx 1/8 in dia. K7705 870-44576		EA	150



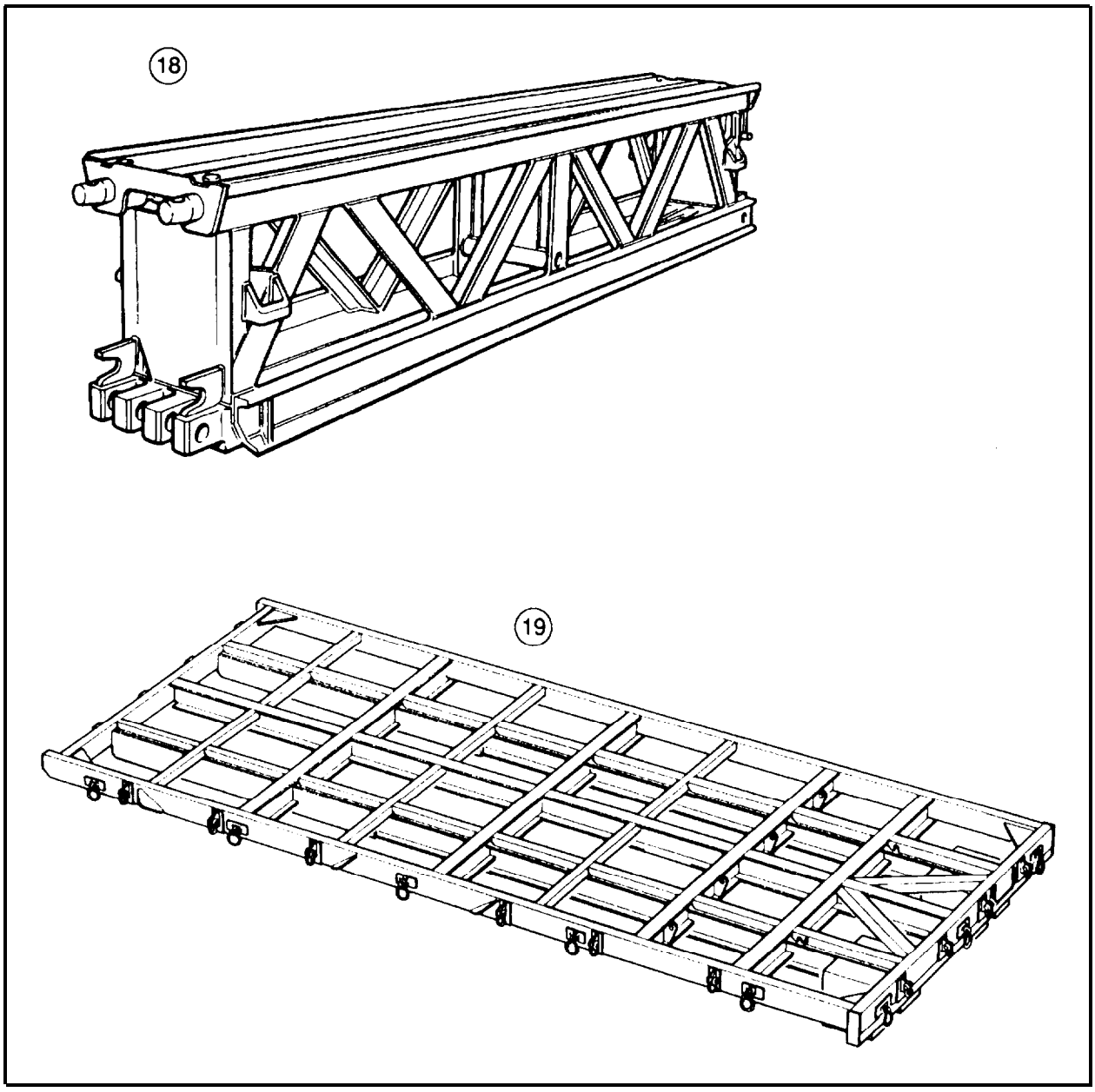
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
10	5420-99-194-5620	BRACKET ASSEMBLY, JACKING: 4 ft 8 1/2in lg, 14 1/2 in w, 18 in h K7705 870-44583	EVM	EA	3
11	5420-99-830-6138	DAVIT POST ASSEMBLY: 9 ft 5 7/8 in lg, 5 ft 5 3/16 in w, 11 7/8 in h K7705 870-44588	EVM	EA	2



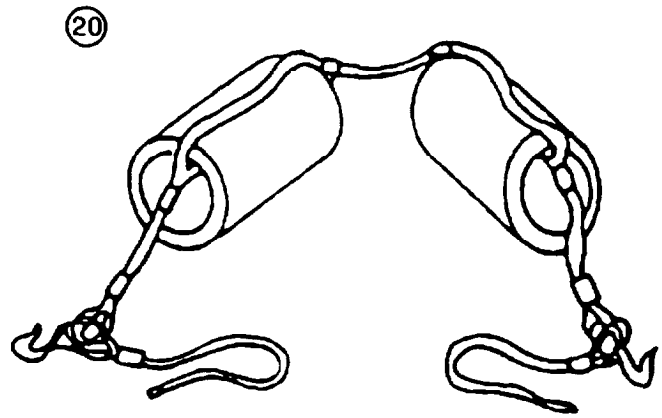
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
12	5420-99-168-6615	FOOTWALK 5 ft 11 7/8 in lg, 2 ft 2 7/8. in w, 2 11/16 in h K7705 870-44587	EVM	EA	5
13	5120-99-930-2008	JACK, HYDRAULIC, 20 TON: 5 in w, 19 in h, 32 in extended K7705 870-44604	EVM	EA	3
14	5420-99-549-3254	JACK SEATING BUILDING FRAME: 12 in lg, 9 in w, 5 in h K7705 870-44553	EVM	EA	2

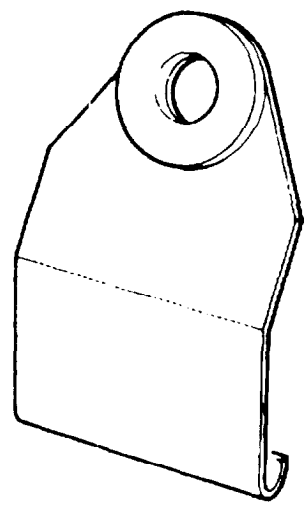


(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
15	5420-99-008-0330	LINK LAUNCHING, TWO TIER: 2 ft 7 in lg, 6 in w K7705 870-44580	EVM	EA	3
16	5420-99-751-9604	LINK, REINFORCING, LONG: 12 ft 3 1/2 in lg, 14 1/16 in w K7705 870-44595	EVM	EA	20
17	5420-99-001-5738	LINK, REINFORCING, SHORT: 6 ft 3 1/2 in lg, 14 1/1 in w K7705 870-44596	EVM	EA	4

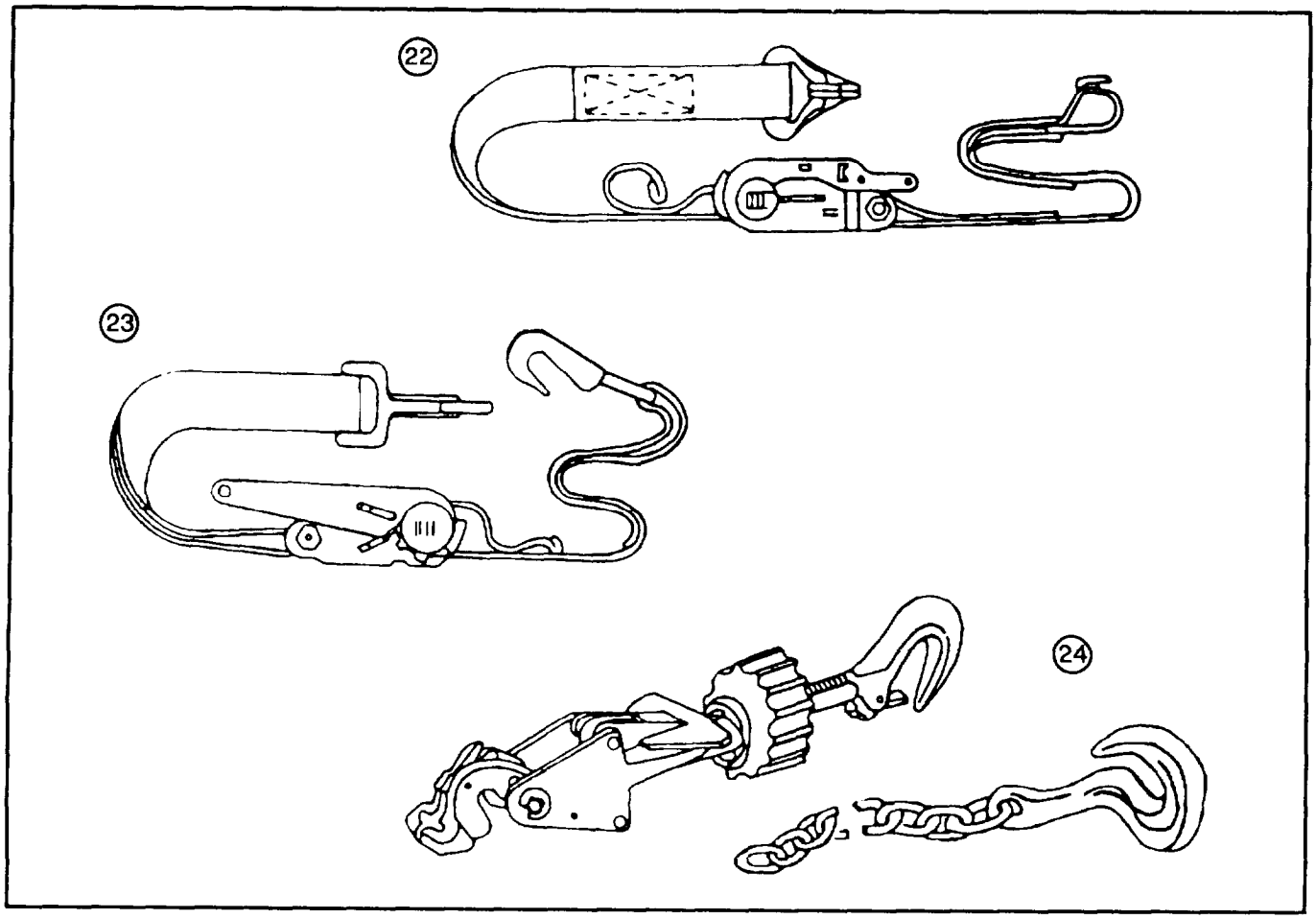


(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
16	5420-99-694-0466	LAUNCHING NOSE UNIT, HEAVY: 10 ft 5 in lg, 16 in w K7705 670-44559	EVM	EA	6
19	5420-99-660-0974	PALLET ASSEMBLY: 14 ft 3 in lg, 6 ft 9 1/4 in w, 1 ft h K7705 670-03-01-101	EVM	EA	2

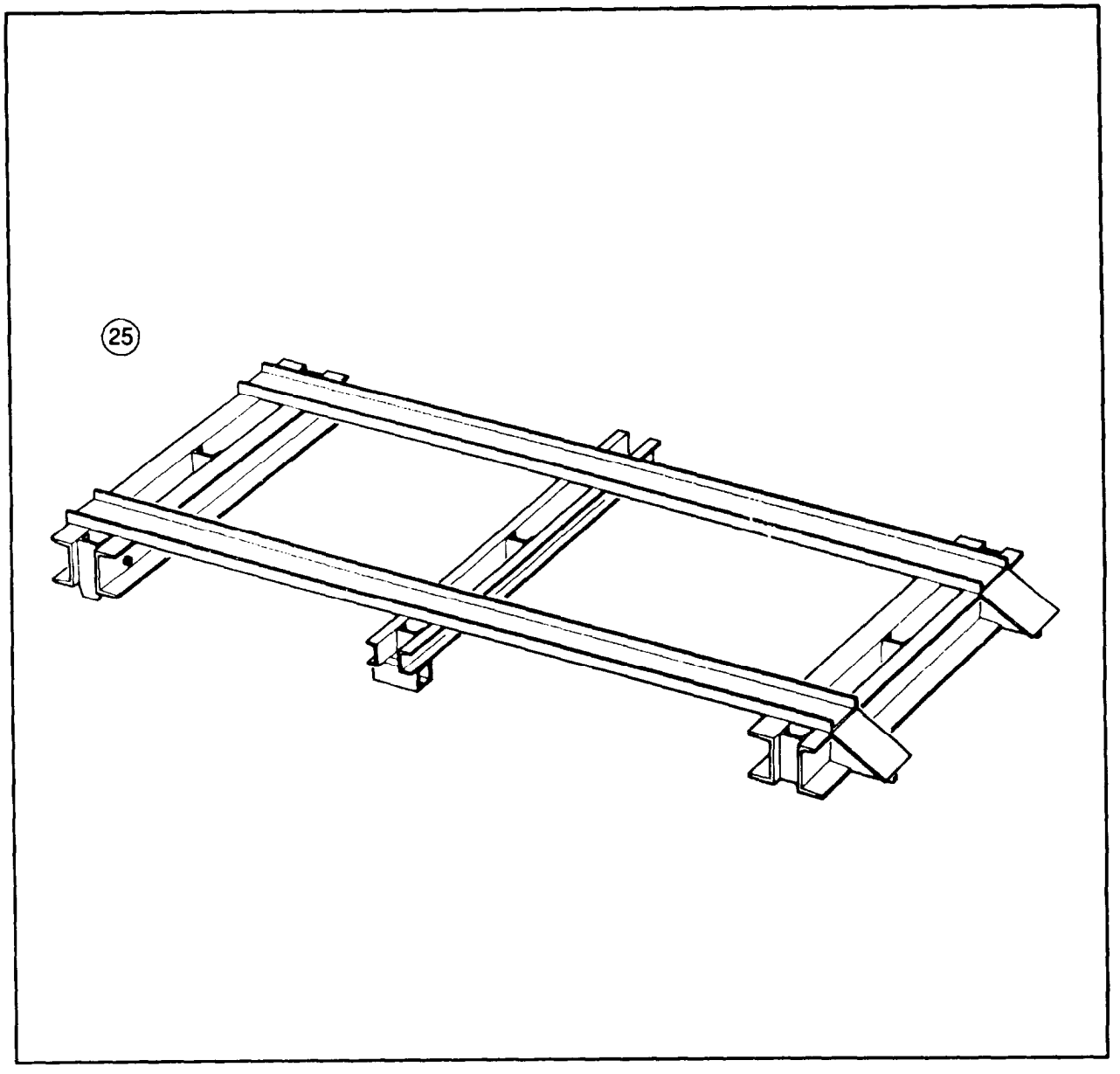




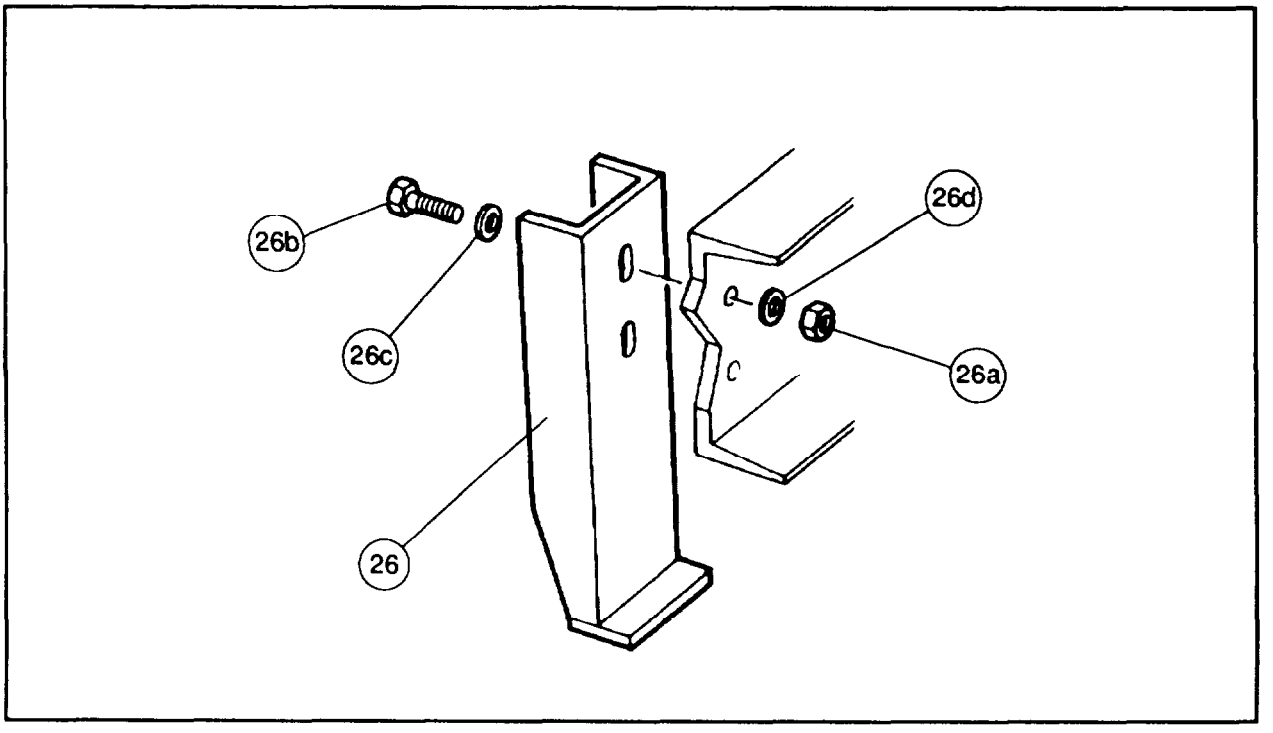
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
20	5420-99-961-2066	PALLET, REAR BUFFER ASSEMBLY: 6 ft 9 in lg, (Truck) K7705 870-03-01-105	EVM	EA	1
21	5420-99-793-5669	LUG, TIE-DOWN: Steel, 4 in w K7705 870-03-01-909	EVM	EA	8



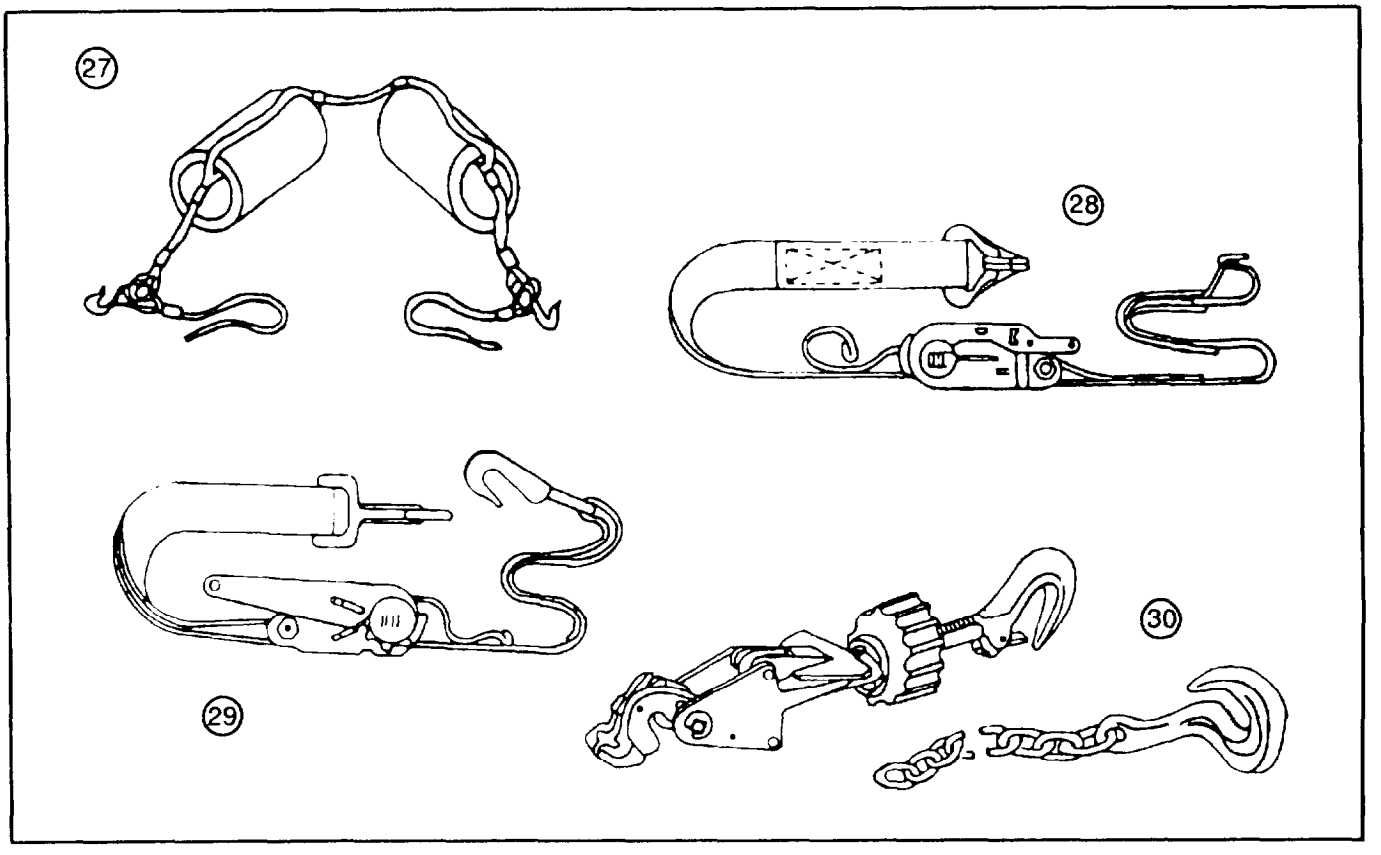
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
22	5420-00-296-9480	STRAP WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Truck) 21-1/2 ft lg, 1.72 in w, 5,000 lb capacity 97403 13219E3029-1	EVM	EA	4
23	5420-00-296-9499	STRAP WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Truck) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVM	EA	9
24	1670-00-545-9062	TIE-DOWN, CARGO: (Truck) 10,000 lb capacity 81349 MIL-T-25959	EVM	EA	2



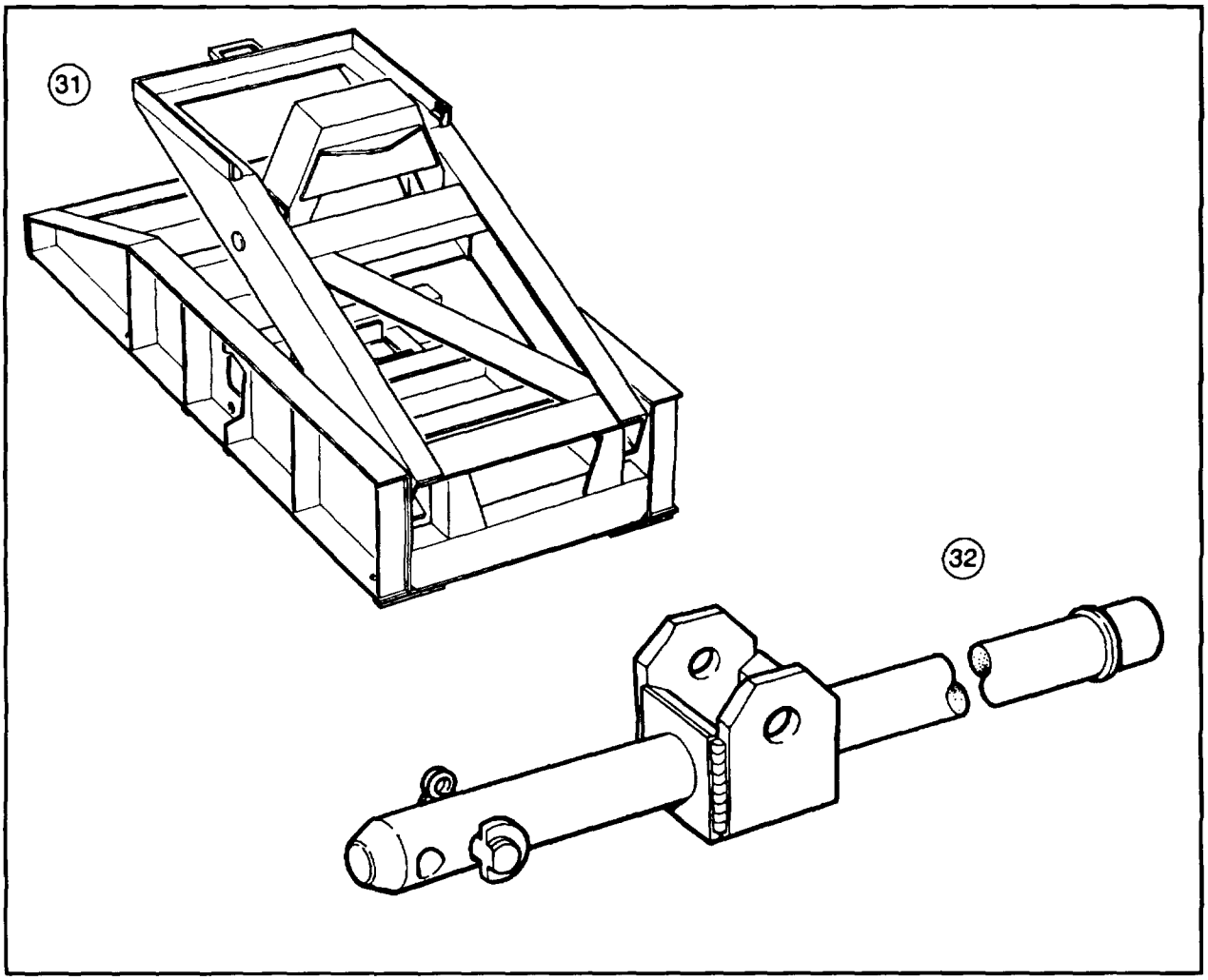
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
25	5420-99-411-3934	PALLET, ADAPTER ASSEMBLY: Steel, 9 ft 1 in lg, 4 ft 10 in w, 10 in h K7705 870-03-01-106	EVM	EA	1



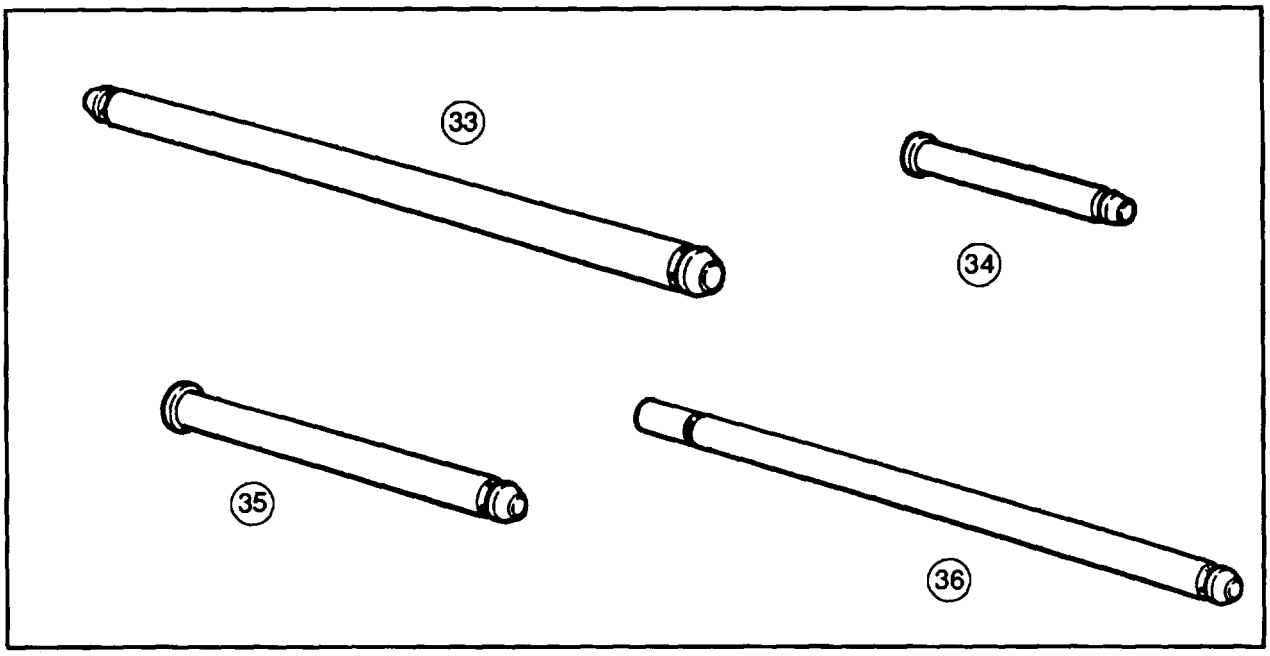
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
26	5420-99-051-3696	BRACKET, ADAPTER: K7705 870-03-01-911 consisting of :	EVK	EA	4
26a	5310-00-732-0558	NUT HEX: Plain, 3/8 - 16 UNC, 96906 MS51967-8	EVK	EA	8
26b	5305-00-725-2317	BOLT HEX HD: 3/8 - 16 UNC, 1 1/2 in lg, steel 96906 MS90728-64	EVK	EA	8
26c	5310-00-080-6004	WASHER FLAT, 3/8 HEAVY: Steel, 96906 MS27183-14	EVK	EA	8
26d	5310-00-637-9541	WASHER, SPRING, 3/8 96906 MS35338-46	EVK	EA	8



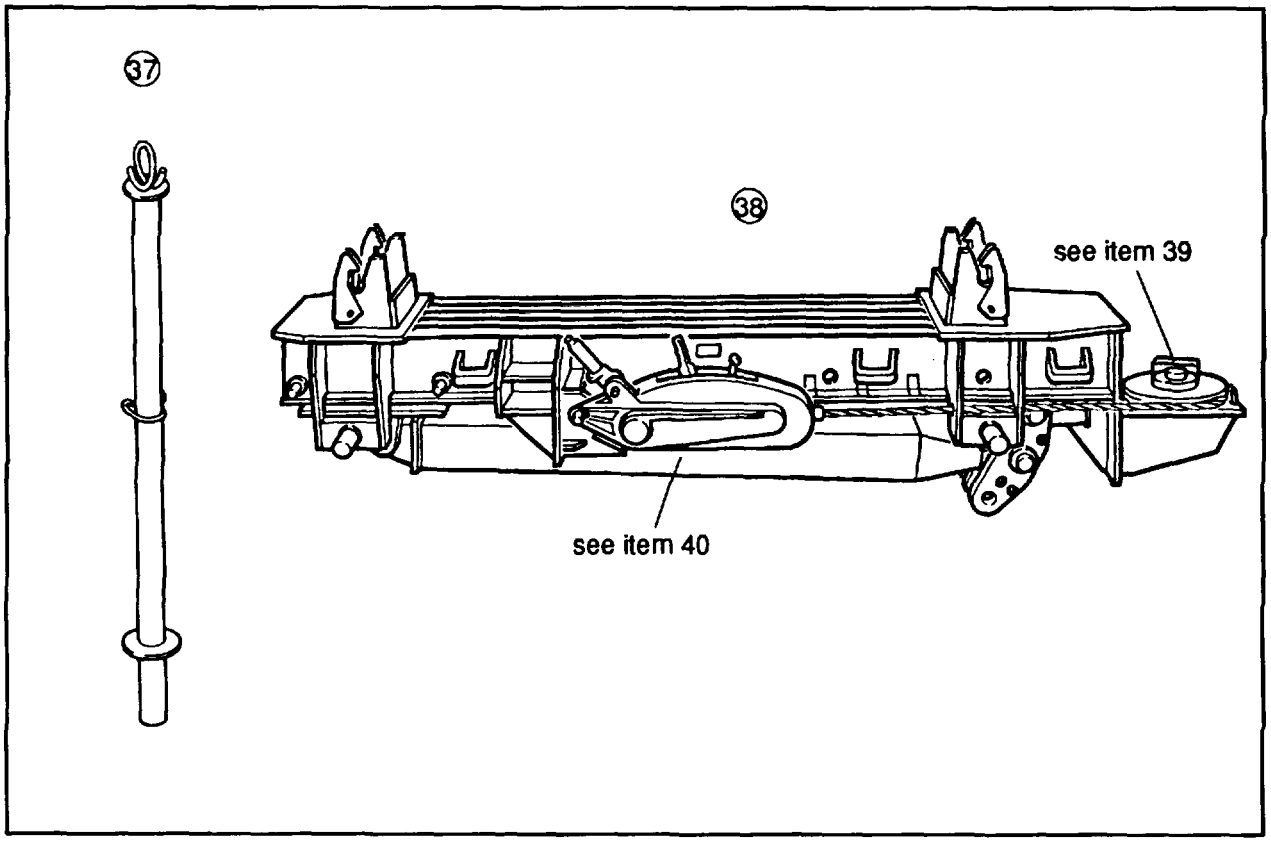
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
27	5420-99-961-2086	PALLET, REAR BUFFER ASSEMBLY: 8 ft 9 in lg (Trailer) K7705 870-03-01-105	EVM	EA	1
28	5420-00-296-9480	STRAP WEBBING: Nylon, ratchet buckle and snap hooks, steel, (Trailer) 21-112 ft lg, 1.72 in w, 5,000 lb capacity 97403 13219E3029-1	EVM	EA	4
29	5420-00-296-9499	STRAP WEBBING: Nylon, ratchet buckle, and snap hooks, steel, (Trailer) 23 ft lg, 1.75 in w, 10,000 lb capacity 97403 13219E3028	EVM	EA	9
30	1670-00-545-9062	TIE-DOWN, CARGO: (Trailer) 10,000 lb capacity 81349 MIL-T-25959	EVM	EA	2



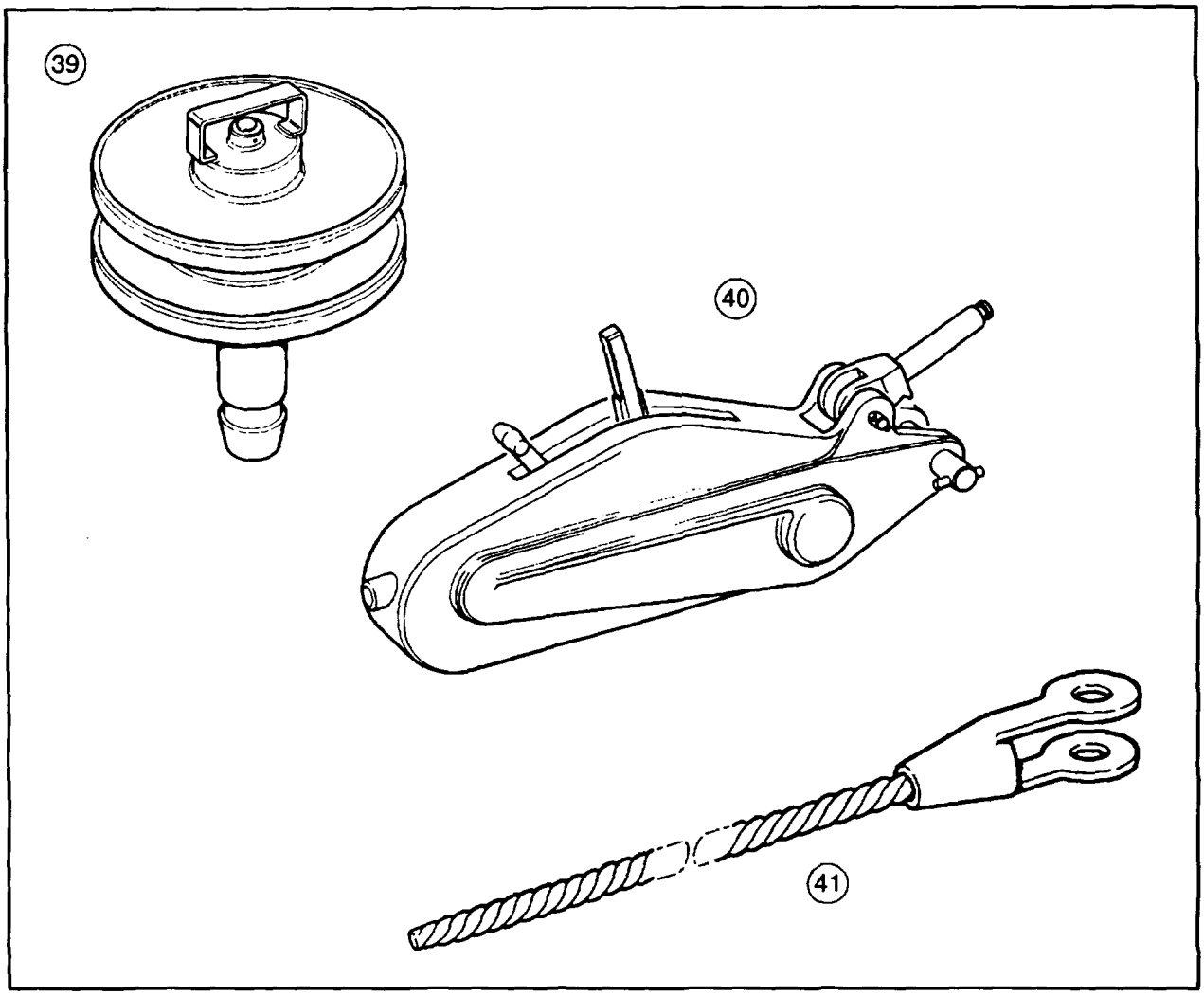
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
31	5420-99-252-1061	PEDESTAL, LANDING ROLLER, ADJUSTABLE, Mk 2: 5 ft 7 1/2 in lg, 30 1/2 in w, 14 1/2 in h K7705 870-44592	EVM	EA	3
32	5420-99-701-0158	ANCHORAGE, PIN ASSEMBLY Mk 2:33 7/8 in lg, 1 3/4 in dia. C/W alloy bracket K7705 870-44585 *This item in quantity given is transferred from LRS set upon issue.	EVL	EA	10*



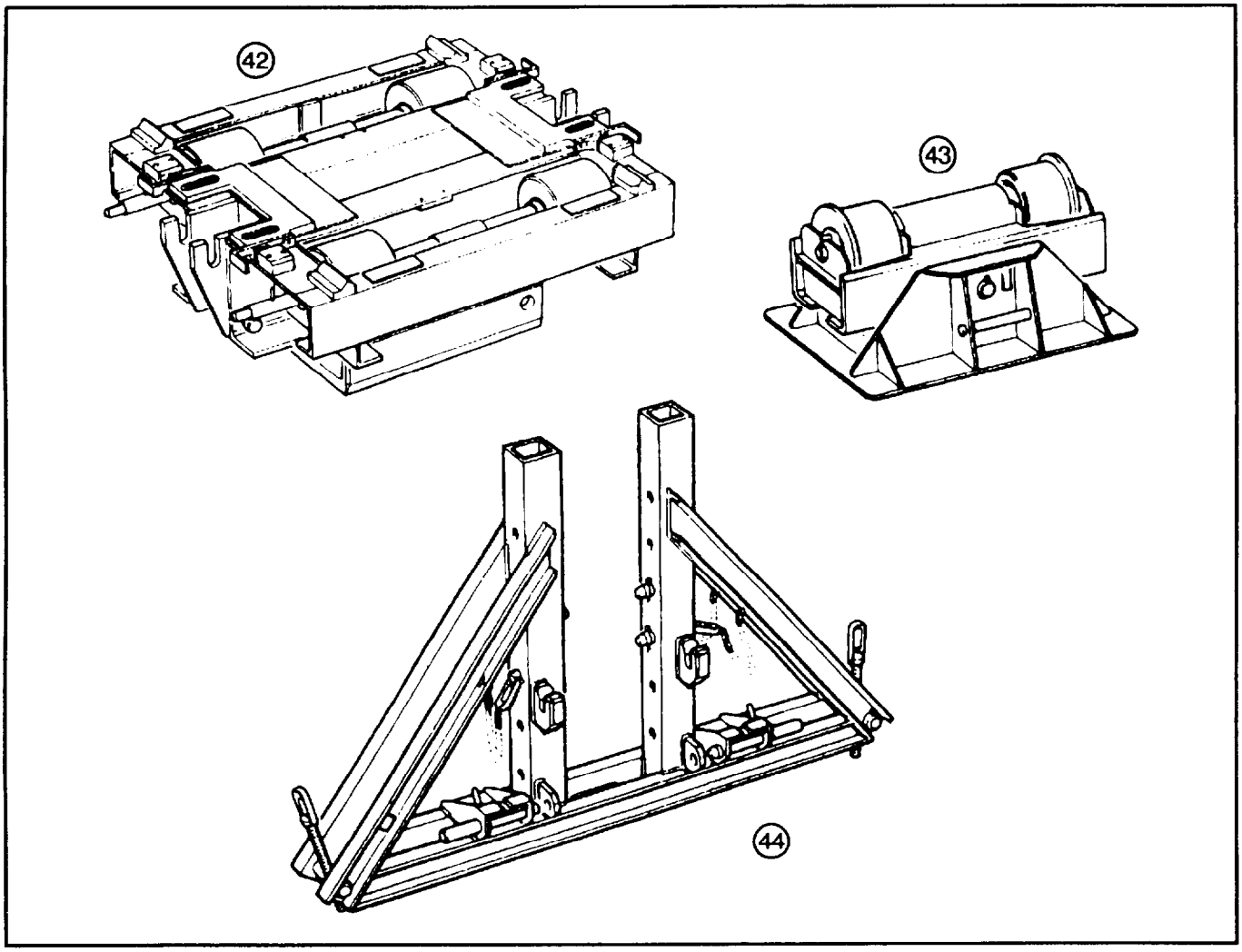
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
33	5420-99-931-8522	PIN, PANEL, HEADLESS: Steel alloy, 1 3/4 in dia., 29 in lg K7705 870-44572	EVL	EA	1
34	5420-99-931-8717	PIN, BRACING: Steel alloy, 1 in dia., 7 1/4 in lg K7705 870-44574	EVL	EA	22
35	5420-99-931-8718	PIN, LAUNCHING NOSE: Steel alloy, 17 1/8 in lg, 1 1/4 in dia. K7705 87044575	EVL	EA	40
36	5420-99-931-8719	PIN, PANEL Steel alloy, 28 1/4 in lg, 1 3/4 in dia. K7705 870-44573	EVL	EA	1



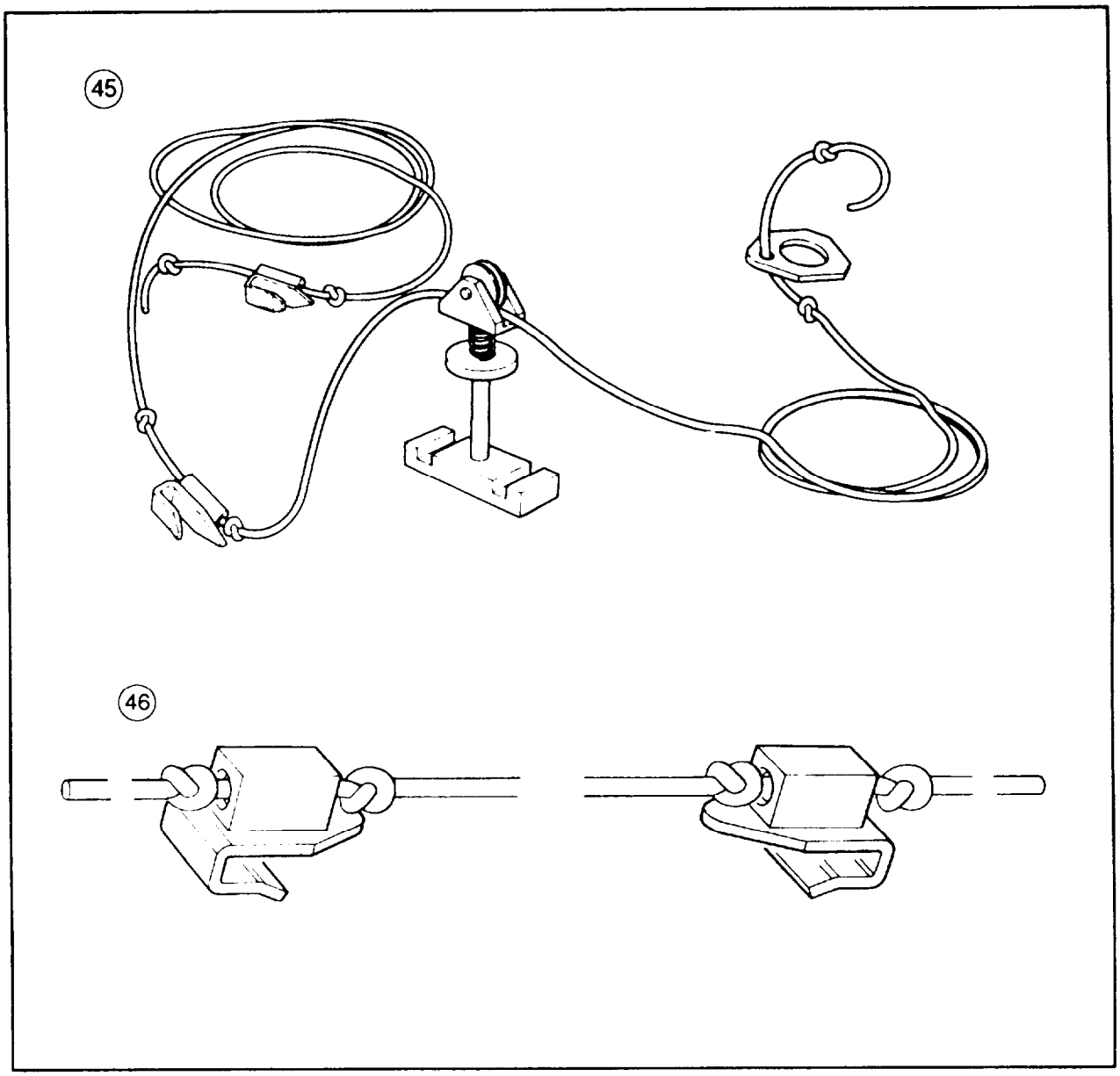
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
37	5420-99-701-0159	POST, FOOTWALK: 4 ft 3 in lg, 3 3/18 in w K7705 870-44606	EVM	EA	10
38	5420-99-198-3199	POST, TENSIONING ASSEMBLY (Short Post): 9 ft 4 in lg, 2 ft 3 3/4 in w, 2 ft 10 1/16 in h K7705 870-44593	EVM	EA	5



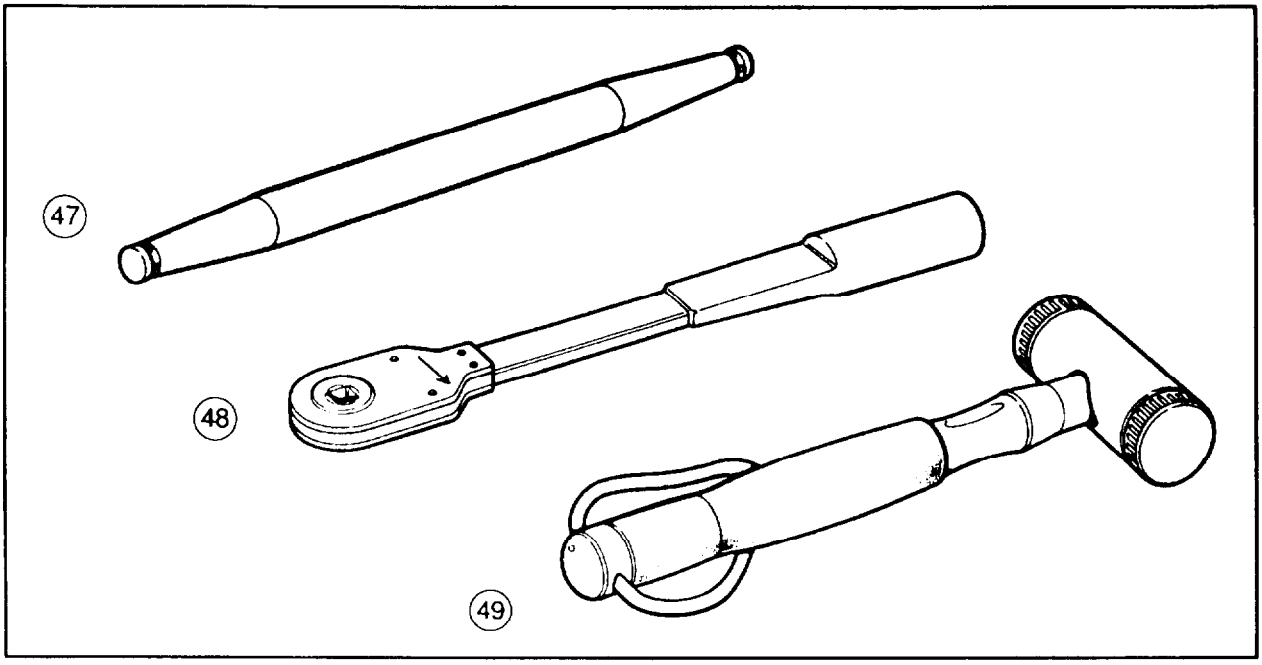
(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	(3) DESCRIPTION, CAGEC and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
39	5420-99-441-3468	BLOCK TACKLE: Used on item 38, 12 in dia. pulleys, 11 in lg K7705 870-50221	EVM	EA	5
40	5120-99-729-3349	PULLER, RATCHET LEVER, CABLE TYPE: Used on item 38, 22 1/2 in lg, Wt 33 lb K7705 870-44610	EVM	EA	7
41	4010-99-931-8108	WIRE ROPE ASSEMBLY, SINGLE LEG: 40 ft lg, 5/8 in dia. K7705 870-50119	EVM	EA	3



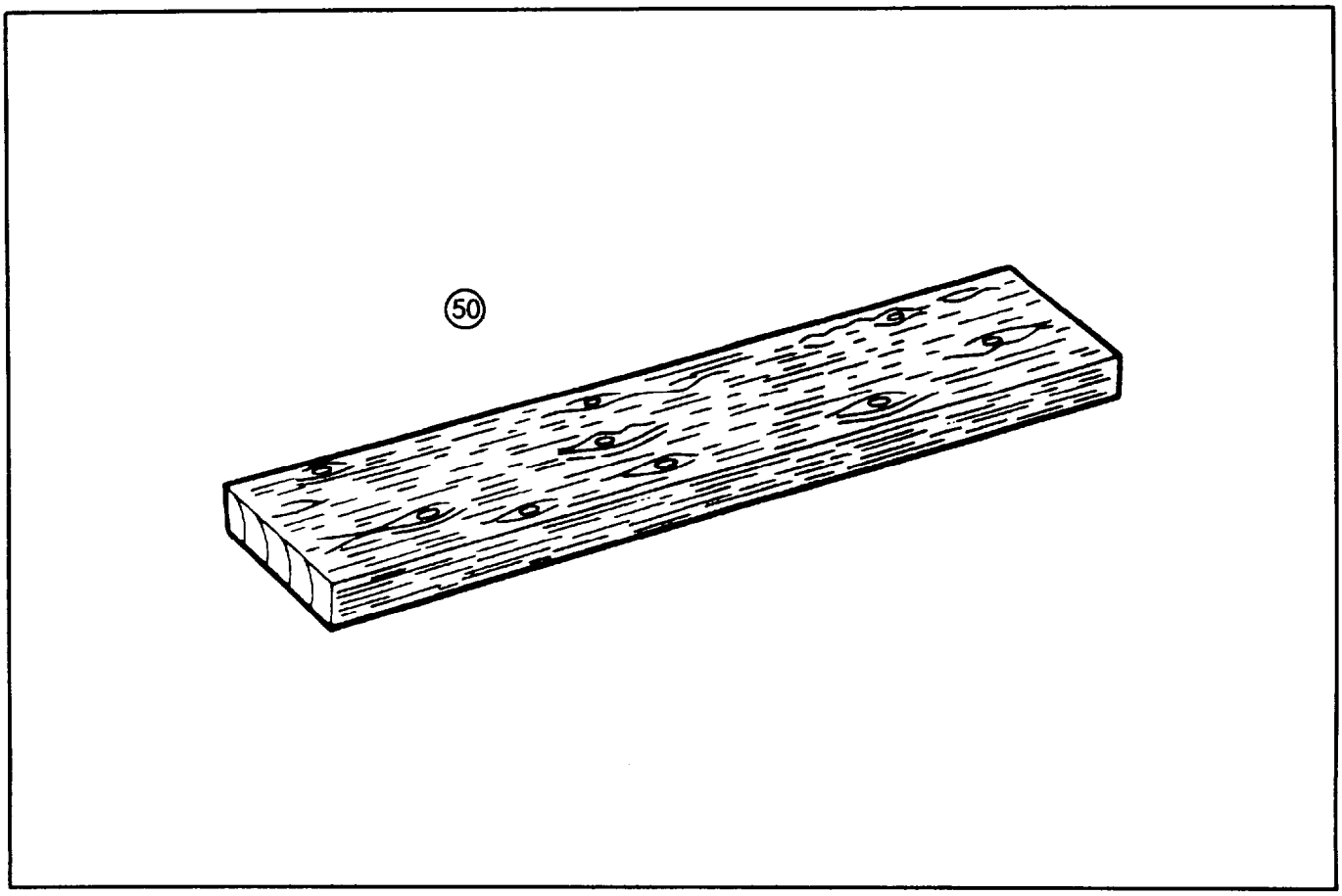
(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
42	5420-99-793-5887	ROLLER ASSEMBLY, ROCKING: 25-9/16 in lg, 35-7/16 in w, 13-11/16 in h K7705 870-04-01-101	EVM	EA	3
43	5420-99-951-8739	ROLLER, LANDING: 16 in lg, 22-1/2 in w, 11 in h K7705 870-44563	EVM	EA	2
44	5420-99-108-9675	ROLLER BEAM SUPPORT ADJUSTABLE: 5 ft 5 in lg, 7 in w, 3 ft 8 in h K7705 870-44544	EVM	EA	2



(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Pan Number	Usable On Code	(4) U/M	(5) Qty Reqd
45	5420-99-553-0675	TACKLE, LIGHT 25 ft lg, assembly of rope, pulley block and hooks, Wt 2 lb K7705 870-44598	EVM	EA	20
46	5420-99-031-7108	ROPE, GUARD: 30 ft lg, rope and hooks, Wt 2 lb K7705 870-44597	EVM	EA	4



(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
47	5420-99-931-8152	PIN, CAPSILL: 20 1/2 in lg, 1 1/2 in dia. K7705 870-44581	EVM	EA	3
48	5420-99-349-6462	WRENCH RATCHET REVERSIBLE 3/4 in, 22 1/2 in lg K7705 870-44582	EVM	EA	3
49	5120-99-738-0625	HAMMER HAND: Wt 1 1/2 lb K7705 870-50247	EVM	EA	6



(1) Illus Number	(2) Nato Stock Number	(3) Description, CAGEC and Part Number	Usable On Code	(4) U/M	(5) Qty Reqd
50	5420-99-442-3354	TIMBER, PACKING: 8 in x 3 in x 84 in K7705 870-50305	EVL	EA	4

Section III. BASIC ISSUE ITEMS
BRIDGE ERECTION SET, FIXED BRIDGE, UK MGB

(1) ILLUS NUMBER	(2) NATO STOCK NUMBER	DESCRIPTION(3) FSCM and Part Number	Usable On Code	(4) U/M	(5) QTY Reqd
		OPERATOR MANUAL TM5 - 5420 - 212 - 10 - 1		EA	1
		OPERATOR MANUAL TM5 - 5420 - 212 - 10 - 2		EA	1

Appendix C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1 SCOPE

This appendix lists additional items you are authorized for the support of the Medium Girder Bridge.

C-2 GENERAL

This list identifies items that do not have to accompany the Medium Girder Bridge and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3 EXPLANATION OF COLUMNS

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the typed document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you. The following provides an explanation of columns found in the tabular listings:

a. Column (1) - Nato Stock Number. Indicates the Nato stock number assigned to the item and will be used for requisitioning purposes.

b. Column (2) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the Functional Source Code Manufacture (FSCM), in parentheses followed by the part number.

c. Column (3) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

d. Column (4) - Quantity authorized (OTY AUTH). Indicates the quantity of the item authorized to be used with/on the equipment..

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER	USABLE ON CODE	(3) U/M	(4) Qty Auth
	MTOE AUTHORIZED ITEMS			
	CTA AUTHORIZED ITEMS			
3950-00 292-9882	HOIST, CHAIN: 5 ton, 6 ft lift handriven: integral hook suspension; 2 load chains, lever and ratchet: adjustable to 2 tons; 11 - ft lift.		EA	4

Appendix D

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1 SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the Medium Girder Bridge. These items are authorized to you by CTA, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2 EXPLANATION OF COLUMNS

a. Column (1) - Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.

b. Column (2) - Level. This column identifies the lowest level of maintenance that required the listed item. [C - Operator/Crew]

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
(1)	C	9150-00-190-0907	Grease, Automotive and Artillery (GAA), (81349), MIL-G-1 0924.	LB
(2)	C	9150-00-263-3490	Oil, Lubricating, General Purpose, Low Temp., MIL-L-7870A.	QT
(3)	C	5110-00-558-0426	Lumber, Treated 3 in x 8 in x 14ft (40 req'd), to be cut into lengths required for use as packing. (Alternative to Appendix B, para. B-5 illus. 49, and B-6 illus. 44)	EA
(4)	C	4030-00-243-4441	Clamp, Wire rope: Steel, Galvanized U-lt for 5/8 inch wire rope (minimum required-48).	EA
(5)	C	5120-00-224-2661	Grip, Cable Jaw: Parallel, Bronze Lined. Steel Jaws, Smooth Surfaces: 15,000 lb Safe Load: 1/2 to 3/4 in diameter wire rope (minimum required-8).	EA

Note: See - 23 for relevant comments.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
(6)	C	5210-00-239-0892	Level, Carpenter Aluminium 24 inch.	EA
(7)	C	5210-00-221-1862	Tape, Steel 50 meter.	EA
(8)	C	5120-00-900-6096	Hammer, Blacksmith, 8 lb, double face, fibreglass handle (for anchorage use only-not to be used on bridge components) (minimum required-4).	EA
(9)	C	4010-00-274-6831	Rope, Wire, Improved Plow Steel, 5/8 in dia. 6 x 19, fiber core, 16.7 tons breaking strength, 300 ft nominal O/A length (minimum required-8).	EA
(10)	C	4030-00-270-8708	Thimble, Rope: Split Oval, Galvanized for 5/8 in dia wire rope (minimum required-16).	EA
(11)	C	5120-00-264-3796	Wrench, Open End, Adjustable: 12 in, single head; 0 to 1.322 inch jaw opening (minimum required-4).	EA
(12)	C	5420-00-371-9890	Assembly, Holdfast, Chain Type: Chain 6 feet lg, 6 inch links, C/W (minimum required-8) Picket, Steel: 1 1/4 in dia, 42 in long.	EA
(13)	C	8030-00-165-8577	Primer (wash) Pretreatment, DOD-P-15328, (Formula Number 117 for Metals), 5 gallon.	KT
(14)	C	8010-00-082-2477	Primer Coating, Epoxy-Polyamide, Chemical and Solvent Resistant, MIL-P-23377, Type I (see note 1), 10 gallon.	KT
(15)	C	8010-01-160-6743	Coating, Aliphatic Polyurethane, Chemical Agent Resistant, MIL-C-46168 (Type II), Component A (see note 2), Green 383, Color Number 34094, 55 gallon.	KT
(16)	C	8010-01-132-0205	Coating, Aliphatic Polyurethane, Chemical Agent Resistant, MIL-6168 (Type II), Component B (see note 2), 55 gallon.	KT
(17)	C	8010-00-280-1751	Thinner, MIL-T-81772, Type I, 55 gallon.	GL
(18)	C	8010-01-168-0684	Thinner, MIL-T-81772, Type II, 55 gallon.	GL
(19)	C	5610-00-141-7838	Walkway Compound, Non-slip and Walkway Matting, Non-slip MIL-W-5044 Type II.	GL

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
(20)	C	8030-00-081-2330	Thread Locking Compound 241 Medium Strength	EA
(21)	C	9150-01-035-5392	Heavy Gear Oil	QT
(22)	C	6850-00-281-1985	Solvent P-D-680	QT
(23)	C		Use item 19	
(24)	C		Use item 19	
(25)	C	5350-00-221-0872	Crocus Cloth	EA
(26)	C	4030-00-278-0699	Shackle	EA
(27)	C	8010-00-582-5318	Zinc Chromate	GL

NOTE 1: (Item 14) Consult your local environmental co-ordinator before beginning any painting operation; use of some materials may be prohibited locally. Where use of chromate-containing coatings is prohibited, substitute MIL-P-53022 (420 grams/litre VOC), NSN 8010-01-187-9820, for MIL-P-23377.

NOTE 2: (Items 15 & 16) Four parts component A are mixed with one part component B; if you order four drums of component A, one drum of component B will also be shipped. Single component MIL-C-53039, NSN 8010-01-232-8514, may be substituted for two component MIL-C-46168; type IV MIL-C-46168 may also be substituted for type II.

Appendix E

COMPONENTS PER BRIDGE LENGTH, BASKET AND PALLET LOADS

E-1 COMPONENTS PER BRIDGE LENGTH

TABLE E-1 Components per Bridge Length (Single Story)

Bridge Length / No. of Bays	4	5	6	7	8	9	10	11	12
Component / Nose Construction	LLN	LLN	LLN	LLN	LLN	5N1	5N1	6N1	6N1
Adapter, Assembly Push Bar	-	-	-	-	-	1	1	1	1
Anchorage Pin Assembly, Mk 2’	4	4	4	4	4	4	4	4	4
Bag, Equipment	1	1	1	1	1	1	1	1	1
Baseplate, DS	-	-	-	-	-	-	-	-	-
Baseplate, SS***	2	2	2	2	2	2	2	2	2
Basket, Equipment ^	4	4	5	6	6	6	7	7	7
Beam, Bankseat	2	2	2	2	2	2	2	2	2
Brace, Sway	-	-	-	-	-	-	-	-	-
Capsill	-	-	-	-	-	-	-	-	-
Carrying Bar	8	8	16	16	16	16	16	16	16
Carrying Handle	8	8	16	16	16	16	16	16	16
Clip, Panel Pin	14	16	18	20	24	35	37	40	42
Cross Girder, Building Frame	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	-	-	-	-	-	1	1	1	1
Cross Girder, Push Bar	-	-	-	-	-	1	1	1	1
Curb	8	10	12	14	16	18	20	22	24
Deck Unit	16	20	24	28	32	36	40	44	48
Extractor,Cable Assembly	1	1	1	1	1	1	1	1	1
Jack, Hydraulic, 15 ton	2*	2*	2*	2	2	2	2	2	2
Jack, Hydraulic, 20 ton	-	-	-	-	-	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	-	-	-	-	-
Launching Nose Unit, Heavy	-	-	-	-	-	5	5	6	6
Launching Nose Unit, Light, Front	1	1	1	1	1	1	1	1	1
Launching Nose Unit, Light, Rear	1	1	1	1	1	1	1	1	1
Link, Launching Two Tier	-	-	-	-	-	-	-	-	-
Longitudinal Girder Bldg. Frame	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	6	8	8	12	10	12	12	16	14

TABLE E-1 (cont'd) Components per Bridge Length (Single Story)

Bridge Length No. of Bays	4	5	6	7	8	9	10	11	12
Component / Nose Construction	LLN	LLN	LLN	LLN	LLN	5N1	5N1	6N1	6N1
Pallet Equipment, Trailer Mounted	1	1	1	1	2	2	2	2	2
Pallet Equipment, Truck Mounted	1	1	2	2	2	2	3	3	3
Panel, Bottom	-	-	-	-	-	-	-	-	-
Panel, End Taper	-	-	-	-	-	-	-	-	-
Panel, Erection Aid	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	-	-	-	-	-	-	-
Panel, Top	8	10	12	16	20	18	20	22	24
Pedestal, Landing Roller Mk 1	-	-	-	-	-	1	1	1	1
Pedestal Landing Roller Mk 2	-	-	-	-	-	-	-	-	-
Pedestal, Building	2	2	2	2	2	2	2	2	2
Pin, Bracing	-	-	-	-	-	4	4	4	4
Pin, Capsill									
Pin, Launching Nose**	4	4	4	4	4	10	10	11	11
Pin, Panel	10	12	14	16	20	17	19	21	23
Pin, Panel, Headless	-	-	-	-	-	4	4	4	4
Post, Jacking (incl. Bracket Assy, Lifting	2	2	2	2	2	2	2	2	2
Post,Launching Nose,Cross Girder	-	-	-	-	-	2	2	2	2
Push Bar, Long Launching	-	-	-	-	-	-	-	-	-
Push Bar, Short Launching	-	-	-	-	-	1	1	1	1
Ramp Unit, Special 14 ft	-	-	-	-	-	-	-	-	-
Ramp Unit Standard	14	14	14	14	14	14	14	14	14
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-
Roller Beam	1	1	1	1	1	1	1	1	1
Roller Beam Support, Adjustable	-	-	-	-	-	-	-	-	-
Roller Beam Support Assy, Fixed	2	2	2	2	2	2	2	2	2
Roller, Landing	1	1	1	1	1	1	1	1	1
Roller, Launching Nose, Mk 2	-	-	-	-	-	1	1	1	1

TABLE E-1 (cont'd) Components per Bridge Length (Single Story)

Bridge Length No. of Bays		4	5	6	7	8	9	10	11	12
Component	Nose Construction	LLN	LLN	LLN	LLN	LLN	5N1	5N1	6N1	6N1
Sling, Multiple Leg		1	1	1	1	1	1	1	1	1
Support, Jack***		-	2	2	2	2	2	2	2	2
Wrench, Ratchet, Rev. 3/4 in		-	-	-	-	-	-	-	-	-

NOTE:

^ Increase by 1 if anchorage is required.

* If required by site conditions.

** Two required for jack supports and baseplates for bad site conditions.

*** Quantity given required for RB. Two additional baseplates required under jacks if site conditions are bad for 6 thru 12 bay bridges.

**** Two required for baseplates and jacks when site conditions are bad.

TABLE E-2 Components per Bridge Length (Double Story)

Bridge Length No. of Bays	1	2	3	4	5	6	7	8	9	10	11	12
Component / Nose Construction	2N1	3N1	3N1	3N1	4N1	4N1	4N1	5N1	5N1	5N1	6N1	6N1
Adapter, Assembly Push Bar	1	1	1	1	1	1	1	1	1	1	1	1
Anchorage Pin Assembly Mk 2*	8	8	8	8	8	8	8	8	8	8	8	8
Bag, Equipment	3	3	3	3	3	3	3	3	3	3	3	3
Baseplate DS	4	4	4	4	4	4	4	4	4	4	4	4
Baseplate SS -	-	-	-	-	-	-	-	-	-	-	-	-
Basket, Equipment ^	11	12	13	13	13	14	15	15	16	17	17	18
Beam, Bankseat	2	2	2	2	2	2	2	2	2	2	2	2
Brace, Sway	5	6	7	8	9	10	11	12	13	14	15	16
Capsill	-	-	-	-	-	-	-	-	-	-	-	-
Carrying Bar	24	24	24	24	24	24	24	24	24	24	24	24
Carrying Handle	24	24	24	24	24	24	24	24	24	24	24	24
Clip, Panel Pin	78	83	87	91	96	100	104	109	113	117	122	126
Cross Girder, Building Frame	2	2	2	2	2	2	2	2	2	2	2	2
Cross Girder, Launching Nose	1	1	1	1	1	1	1	1	1	1	1	1
Cross Girder, Push Bar	-	-	-	-	-	-	-	-	1	1	1	1
Curb	10	12	14	16	18	20	22	24	26	28	30	32
Deck Unit	24	28	32	36	40	44	48	52	56	60	64	68
Extractor, Cable Assembly	1	1	1	1	1	1	1	1	1	1	1	1
Jack, Hydraulic, 15 ton	5	5	5	5	5	5	5	5	5	5	5	5
Jack, Hydraulic, 20 ton	-	-	-	-	-	-	-	-	-	-	-	-
Jack Seating, Building Frame	4	4	4	4	4	4	4	4	4	4	4	4
Launching Nose Unit, Heavy	2	3	3	3	4	4	4	5	5	5	6	6
Launching Nose Unit, Light, Front	1	1	1	1	1	1	1	1	1	1	1	1
Launching Nose Unit, Light, Rear	1	1	1	1	1	1	1	1	1	1	1	1
Link, Launching Two Tier	-	-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder Bid Frame	2	2	2	2	2	2	2	2	2	2	2	2
Marker, Guide Assembly	12	12	16	14	16	16	20	18	20	20	24	22
Pallet,Equipment Trailer Mounted	2	2	2	3	3	3	3	3	3	4	4	4
Pallet, Equipment Truck Mounted	3	3	3	3	3	3	4	4	4	4	4	4
Panel, Bottom	2	4	6	8	10	12	14	16	18	20	22	24

TABLE E-2 (cont'd) Components per Bridge Length (Double Story)

Bridge Length No. of Bays		1	2	3	4	5	6	7	8	9	10	11	12
Component	Nose Construction	2N1	3N1	3N1	3N1	4N1	4N1	4N1	5N1	5N1	5N1	6N1	6N1
Panel, End Taper		4	4	4	4	4	4	4	4	4	4	4	4
Panel, Erection Aid		2	2	2	2	2	2	2	2	2	2	2	2
Panel, Junction		4	4	4	4	4	4	4	4	4	4	4	4
Panel, Top		10	12	14	16	18	20	22	24	26	28	30	32
Pedestal Landing Roller Mkl		1	1	1	1	1	1	1	1	1	1	1	1
Pedestal Landing Roller Mk 2		-	-	-	-	-	-	-	-	-	-	-	-
Pedestal Building		-	-	-	-	-	-	-	-	-	-	-	-
Pin, Bracing		14	16	18	20	22	24	26	28	30	32	34	36
Pin, Capsill		-	-	-	-	-	-	-	-	-	-	-	-
Pin, Launching Nose		9	10	10	10	11	11	11	12	12	12	13	13
Pin, Panel		31	35	39	43	47	51	55	59	63	67	71	75
Pin, Panel, Headless		4	4	4	4	4	4	4	4	4	4	4	4
Post Jacking (incl. Bracket Assy, Lifting)		2	2	2	2	2	2	2	2	2	2	2	2
Post, Launching Nose, Cross Girder		2	2	2	2	2	2	2	2	2	2	2	2
Push Bar, Long Launching		-	-	-	-	-	-	-	-	-	-	-	-
Push Bar, Short Launching		1	1	1	1	1	1	1	1	1	1	1	1
Ramp Unit Special 14 ft		14	14	14	14	14	14	14	14	14	14	14	14
Ramp Unit, Standard		-	-	-	-	-	-	-	-	-	-	-	-
Roller Assembly, Rocking		-	-	-	-	-	-	-	-	-	-	-	-
Roller Beam		2	2	2	2	2	2	2	2	2	2	2	2
Roller Beam Support, Adjustable		4	4	4	4	4	4	4	4	4	4	4	4
Roller Beam Support, Fixed		-	-	-	-	-	-	-	-	-	-	-	-
Roller, Landing		1	1	1	1	1	1	1	1	1	1	1	1
Roller, Launching Nose, Mk 2		1	1	1	1	1	1	1	1	1	1	1	1
Sling Multiple Leg		1	1	1	1	1	1	1	1	1	1	1	1
Support, Jack		2	2	2	2	2	2	2	2	2	2	2	2
Wrench, Ratchet, Rev. 3/4 in		-	-	-	-	-	-	-	-	-	-	-	-

NOTE:
* If required by site conditions.
^ Increase by two if anchorage required.

TABLE E-2 (cont'd) Components per Bridge Length (Double Story w/o LRS)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction	6N1	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2
Component										
Adapter, Assembly Push Bar	1	1	1	1	1	1	1	1	1	1
Anchor Piece Assy	-	-	-	-	-	-	-	-	-	-
Anchorage Pin Assembly Mk 2*	8	8	8	8	8	8	8	8	8	8
Anti-Flutter Cable Assembly	-	-	-	-	-	-	-	-	-	-
Bag, Equipment	3	3	3	3	3	3	3	3	3	3
Baseplate DS	6	6	6	6	6	6	6	6	6	6
Basket, Equipment	18	19	19	20	21	21	22	22	23	23
Beam, Bankseat	2	2	2	2	2	2	2	2	2	2
Bearer, Footwalk	-	-	-	-	-	-	-	-	-	-
Brace, Sway	17	18	19	20	21	22	23	24	25	26
Bracket Assembly Jacking	2	2	2	2	2	2	2	2	2	2
Capsill	1	1	1	1	1	1	1	1	1	1
Carrying Bag	24	24	24	24	24	24	24	24	24	24
Carrying Handle	24	24	24	24	24	24	24	24	24	24
Clip Panel Pin	144	149	153	157	162	166	173	177	181	185
Cross Girder, Building Frame	3	3	3	3	3	3	3	3	3	3
Cross Girder, Launching Nose	1	1	1	1	1	1	1	1	1	1
Cross Girder, Push Bar	1	1	1	1	1	1	1	1	1	1
Curb	34	36	38	40	42	44	46	48	50	52
Davit Post Assembly	2	2	2	2	2	2	2	2	2	2
Deck Unit	72	76	80	84	88	92	96	100	104	108
Extractor Cable Assembly	1	1	1	1	1	1	1	1	1	1
Footwalk	-	-	-	-	-	-	-	-	-	-
Hammer, Hand	-	-	-	-	-	-	-	-	-	-
Jack, Hydraulic 15 ton	6	6	6	6	6	6	6	6	6	6
Jack, Hydraulic, 20 ton	1	1	1	1	1	1	1	1	1	1
Jack Seating, Building Frame	6	6	6	6	6	6	6	6	6	6

TABLE E-2 (cont'd) Components per Bridge Length (Double Story w/o LRS)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction Component	6N1	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2
Launching Nose Unit, Heavy	6	7	7	7	8	8	12	12	12	12
Launching Nose Unit, Light, Front	1	1	1	1	1	1	1	1	1	1
Launching Nose Unit, Light Rear	1	1	1	1	1	1	1	1	1	1
Link, Launching Two Tier	-	-	-	-	-	-	2	2	2	2
Link, Reinforcing, Long	-	-	-	-	-	-	-	-	-	-
Link, Reinforcing, Short-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder Bldg. Frame	2	2	2	2	2	2	2	2	2	2
Marker, Guide Assembly	24	24	30	26	28	28	32	30	34	32
Pallet, Equipment Trailer Mounted	5	5	5	5	5	5	6	6	6	6
Pallet, Equipment Truck Mounted	5	5	5	6	6	6	6	6	6	7
Panel, Bottom	26	28	30	32	34	36	38	40	42	44
Panel, End Taper	4	4	4	4	4	4	4	4	4	4
Panel, Erection Aid	2	2	2	2	2	2	2	2	2	2
Panel, Junction	4	4	4	4	4	4	4	4	4	4
Panel, Top	34	36	38	40	42	44	46	48	50	52
Pedestal Landing Roller Mk 2***	2	2	2	2	2	2	2	2	2	2
Pin, Bracing	44	46	48	50	52	54	56	58	60	62
Pin, Capsill	2	2	2	2	2	2	2	2	2	2
Pin, Launching Nose	13	14	14	14	15	15	18	18	18	18
Pin, Panel	79	83	87	91	95	99	103	107	111	115
Pin, Panel, Headless	4	4	4	4	4	4	5	5	5	5
Post, Jacking** (incl. Bracket Assy, Lifting)	2	2	2	2	2	2	2	2	2	2
Post, Footwalk	-	-	-	-	-	-	-	-	-	-
Post, Launching Nose Cross Gdr.	2	2	2	2	2	2	2	2	2	2
Post, Tensioning Assy	-	-	-	-	-	-	-	-	-	-
Puller, Ratchet Lever, Cable Type** (including cable)	2	2	2	2	2	2	2	2	2	2
Puller Lever2	2	2	2	2	2	2	2	2	2	2
Push Bar, Long, Launching* 2	2	2	2	2	2	2	2	2	2	2

TABLE E-2 (cont'd) Components per Bridge Length (Double Story w/o LRS)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction Component	6N1	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2
Push Bar, Short, Launching*	2	2	2	2	2	2	2	2	2	2
Ramp Unit, Long	14	14	14	14	14	14	14	14	14	14
Roller, Assembly Rocking	2	2	2	2	2	2	2	2	2	2
Roller Beam	2	2	2	2	2	2	2	2	2	2
Roller Beam Support Adjustable	6	6	6	6	6	6	6	6	6	6
Roller, Landing	2	2	2	2	2	2	2	2	2	2
Roller, Launching Nose	1	1	1	1	1	1	1	1	1	1
Rope, Guard	-	-	-	-	-	-	-	-	-	-
Sling, Multiple Leg	1	1	1	1	1	1	1	1	1	1
Support, Jack**	2	2	2	2	2	2	2	2	2	2
Tackle, Light	-	-	-	-	-	-	-	-	-	-
Wrench, Ratchet Rev. 3/4 in	2	2	2	2	2	2	2	2	2	2

NOTE:

* In an emergency minimum of one long push bar required for launch. Short push bar can be used with davits.
** Method of raising/lowering bridge will determine quantity of items.
*** Quantity of 2 required to make re-positioning of LRP under nose easier. LRP can be repositioned with one launching nose heavy section used in place of second LRR
**** If required by site conditions.

TABLE E-3 Components per Bridge Length (Link Reinforced)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction Component	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2
Adapter, Push Bar	1	1	1	1	1	1	1	1	1	1
Anchor Piece Assy	4	4	4	4	4	4	4	4	4	4
Anchorage Pin Assembly, Mk 2****	8	8	8	8	8	8	8	8	8	8
Anti-Flutter Cable Assembly	4	4	4	4	4	4	4	4	4	4
Bag, Equipment	4	4	4	4	4	4	4	4	4	4
Baseplate, DS	6	6	6	6	6	6	6	6	6	6
Basket, Equipment	21	21	22	23	23	24	24	25	25	26
Beam, Bankseat	2	2	2	2	2	2	2	2	2	2
Bearer, Footwalk	8	8	8	8	8	8	8	8	8	8
Brace, Sway	17	18	19	20	21	22	23	24	25	26
Bracket Assembly, Jacking**	2	2	2	2	2	2	2	2	2	2
CapsillI	1	1	1	1	1	1	1	1	1	1
Carrying Bar	32	32	32	32	32	32	32	32	32	32
Carrying Handle	32	32	32	32	32	32	32	32	32	32
Clip, Panel Pin	160	164	170	175	180	190	196	200	206	210
Cross Girder Frame	3	3	3	3	3	3	3	3	3	3
Cross Girder, Launching Nose	1	1	1	1	1	1	1	1	1	1
Cross Girder, Push Bar	1	1	1	1	1	1	1	1	1	1
Curb	34	36	38	40	42	44	46	48	50	52
Davit Post Assembly*	2	2	2	2	2	2	2	2	2	2
Deck Unit	72	76	80	84	88	92	96	100	104	108
Extractor Cable Assembly	1	1	1	1	1	1	1	1	1	1
Footwalk	4	4	4	4	4	4	4	4	4	4
Hammer, Hand	2	2	2	2	2	2	2	2	2	2
Jack, Hydraulic, 15 ton	6	6	6	6	6	6	6	6	6	6
Jack, Hydraulic, 20 ton	1	1	1	1	1	1	1	1	1	1
Jack Seating, Building Frame	6	6	6	6	6	6	6	6	6	6
Launching Nose, Heavy	7	7	7	8	8	12	12	12	12	12

TABLE E-3 (cont'd) Components per Bridge Length (Link Reinforced)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction Component	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6NI + 3N2	6N1 + 3N2
Launching Nose, Light, Front	1	1	1	1	1	1	1	1	1	1
Launching Nose, Light, Rear	1	1	1	1	1	1	1	1	1	1
Link, Launching Two Tier	-	-	-	-	-	2	2	2	2	2
Link, Reinforcing, Long	8	10	10	12	12	14	14	16	16	18
Link, Reinforcing, Short	2	-	2	-	2	-	2	-	2	-
Longitudinal Girder Bldg Frame	2	2	2	2	2	2	2	2	2	2
Marker, Guide Assembly	24	24	26	26	28	28	30	30	32	32
Pallet, Equip.Truck Mounted	6	6	6	6	6	6	7	7	7	7
Pallet, Equip.Trailer Mounted	5	5	5	6	6	6	6	6	6	7
Panel, Bottom	26	28	30	32	34	36	38	40	42	44
Panel, End Taper	4	4	4	4	4	4	4	4	4	4
Panel, Erection Aid	2	2	2	2	2	2	2	2	2	2
Panel, Junction	4	4	4	4	4	4	4	4	4	4
Panel, Top	34	36	38	40	42	44	46	48	50	52
Pedestal Landing Roller Mk 2***	2	2	2	2	2	2	2	2	2	2
Pin, Bracing	44	46	48	50	52	54	56	58	60	62
Pin, Capsill	2	2	2	2	2	2	2	2	2	2
Pin, Launching Nose	29	29	31	32	34	37	39	39	41	41
Pin, Panel	79	83	87	91	95	99	103	107	111	115
Pin, Panel, Headless	4	4	4	4	4	5	5	5	5	5
Post, Jacking** (incl. Bracket Assy, Lifting)	2	2	2	2	2	2	2	2	2	2
Post, Footwalk	8	8	8	8	8	8	8	8	8	8
Post, Launching Nose Cross Girder	2	2	2	2	2	2	2	2	2	2
Post Tensioning Assy (incl puller & cable)	4	4	4	4	4	4	4	4	4	4
Puller, Ratchet Lever, Cable Type'*(incl cable, for jacking brackets)	2	2	2	2	2	2	2	2	2	2
Puller Lever	6	6	6	6	6	6	6	6	6	6
Push Bar, Long, Launching*	2	2	2	2	2	2	2	2	2	2

TABLE E-3 (cont'd) Components per Bridge Length (Link Reinforced)

Bridge Length 2E + No. of Bays	13	14	15	16	17	18	19	20	21	22
Nose Construction Component	7N1	7N1	7N1	8N1	8N1	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2	6N1 + 3N2
Push Bar, Short, Launching* 2	2	2	2	2	2	2	2	2	2	2
Ramp Unit, Long	14	14	14	14	14	14	14	14	14	14
Roller *Beam*	2	2	2	2	2	2	2	2	2	2
Roller Beam Support Assy, Adj.	6	6	6	6	6	6	6	6	6	6
Roller, Landing	2	2	2	2	2	2	2	2	2	2
Roller, Launching Nose	1	1	1	1	1	1	1	1	1	1
Roller Assembly, Rocking	2	2	2	2	2	2	2	2	2	2
Rope, Guard	4	4	4	4	4	4	4	4	4	4
Sling, Multiple Leg	1	1	1	1	1	1	1	1	1	1
Support, Jack**	2	2	2	2	2	2	2	2	2	2
Tackle, Light	8	8	10	10	12	12	14	14	16	16
Wrench, Ratchet Rev. 3/4 in	2	2	2	2	2	2	2	2	2	2

NOTE:

* In an emergency minimum of one long push bar required for launch. Short push bar can be used with davits.

** Method of raising/lowering will determine quantity of items.

*** Quantity of 2 required to make re-positioning of LRP under nose easier. LRP can be repositioned with one launching nose heavy section used in place of second LRP.

**** If required by site conditions.

E-2 BASKETLOADS

a. General

(1) The quantity of components per basket and quantity of baskets per bridge are found in this paragraph.

(2) These basket loads are for the quantities given in Tables E-1, E-2 and E-3 meeting or exceeding those quantities. The basket loads do not conform to any particular pallet load.

(3) All baskets are to be carried by four personnel.

(4) Jacks will not be placed in baskets. Jacks will be placed upright in launching nose heavy sections and tied or strapped to center vertical, or tied into load in a vertical position to prevent loss of hydraulic fluid.

b. Single Story

TABLE E-4 Single Story Basket Loads

	4 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number of Baskets by Type						
	1	-	-	2	-	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	-	-	-	-	-
Carrying Handle	8	-	-	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	-	-	-	-	-
Pin, Launching Nose	6	-	-	-	-	-	-
Pin, Panel	-	-	-	7	-	-	-
Pin, Panel, Headless	-	-	-	-	-	-	-
*If required							

TABLE E-4 (cont'd) Single Story Basket Loads

	5 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	-	-	2	-	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	-	-	-	-	-
Carrying Handle	8	-	-	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	-	-	-	-	-
Pin, Launching Nose	6	-	-	-	-	-	-
Pin, Panel	-	-	-	7	-	-	-
Pin, Panel, Headless	-	-	-	-	-	-	-
*If required							

	6 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	1	-	2	-	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	8	-	-	-	-	-
Carrying Handle	8	8	-	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	-	-	-	-	-
Pin, Launching Nose	6	-	-	-	-	-	-
Pin, Panel	-	-	-	7	-	-	-
Pin, Panel, Headless	-	-	-	-	-	-	
*If required							

TABLE E-4 (cont'd) Single Story Basket Loads

	7 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	1	-	3	-	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	8	-	-	-	-	-
Carrying Handle	8	8	-	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	-	-	-	-	-
Pin, Launching Nose	6	-	-	-	-	-	-
Pin, Panel	-	-	-	-	-	-	-
Pin, Panel, Headless	-	-	-	7	-	-	-
*If required							

	8 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	1	-	3	-	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	8	-	-	-	-	-
Carrying Handle	8	8	-	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	-	-	-	-	-
Pin, Launching Nose	6	-	-	-	-	-	-
Pin, Panel	-	-	-	-	-	-	-
Pin, Panel, Headless	-	-	-	7	-	-	-
*If required							

TABLE E-4 (cont'd) Single Story Basket Loads

	9 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	-	1	2	1	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	8	-	-	-	-
Carrying Handle	8	-	9	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	4	-	-	-	-
Pin, Launching Nose	6	-	5	-	-	-	-
Pin, Panel	-	-	-	7	3	-	-
Pin, Panel, Headless	-	-	-	-	5	-	-
*If required							

	10 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	-	1	3	1	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	8	-	-	-	-
Carrying Handle	8	-	8	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	4	-	-	-	-
Pin, Launching Nose	6	-	5	-	-	-	-
Pin, Panel	-	-	-	7	3	-	-
Pin, Panel, Headless	-	-	-	-	5	-	-
*If required							

TABLE E-4 (cont'd) Single Story Basket Loads

	11 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	-	1	3	1	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	8	-	-	-	-
Carrying Handle	8	-	8	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-		-	-	-	-
Pin, Bracing	-	-	4	-	-	-	-
Pin, Launching Nose	6	-	5	-	-	-	-
Pin, Panel	-	-	-	7	3	-	-
Pin, Panel, Headless	-	-	-	-	5	-	-
*If required							

	12 Bay Single Story						
	Basket Type						
	A	B	C	D	E	F	G
	Number Of Baskets By Type						
	1	-	1	3	1	1	-
Anchorage Pin Assembly Mk 2*	-	-	-	-	-	5	-
Bag, Equipment	1	-	-	-	-	-	-
Carrying Bar	8	-	8	-	-	-	-
Carrying Handle	8	-	8	-	-	-	-
Clip, Retainer (In Bag)	75	-	-	-	-	-	-
Handle, Jack	2	-	-	-	-	-	-
Pin, Bracing	-	-	4	-	-	-	-
Pin, Launching Nose	6	-	5	-	-	-	-
Pin, Panel	-	-	-	7	3	-	-
Pin, Panel, Headless	-	-	-	-	5	-	-
*If required							

c. Double Story

All double story basket loads (except 2E + 12 bay) have quantity of components required (no spares). The 2E + 12 Bay basket loads contain some spares. In all cases, the quantities *given* will be enough to complete the mission.

TABLE E-5 Double Story Basket Loads

	2E + 1 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	4	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 2 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	5	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	5	-	-	-	-
*If required						

	2E + 3 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	6	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 4 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	6	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

	2E + 5 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	6	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 6 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	7	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

	2E + 7 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	8	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 8 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	8	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

	2E +9 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	9	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 10 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	10	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

	2E + 11 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	10	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

TABLE E-5 (cont'd) Double Story Basket Loads

	2E +12 Bay Double Story					
	Basket Type					
	A	D	E	F	G	H
	Number of Baskets by Type					
	2	11	1	2	1	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-	-
Bag, Equipment	1	-	-	-	1	-
Carrying Bar	8	-	-	-	8	-
Carrying Handle	8	-	-	-	8	-
Clip, Retainer (in bag)	75	-	-	-	75	-
Handle, Jack	2	-	-	-	1	-
Jack Seating, Building Frame	-	-	-	-	4	-
Pin, Bracing	-	-	-	-	-	38
Pin, Launching Nose	6	-	-	-	11	-
Pin, Panel	-	7	3	-	-	-
Pin, Panel, Headless	-	-	5	-	-	-
*If required						

	2E + 13 Bay Double Story				
	Basket Type**				
	A	D	E	F	I
	Number of Baskets by Type				
	3	11	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required *Basket load configurations when depot stocked					

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 14 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	12	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

	2E + 15 Bay Double Story				
	Basket Type**				
	A	D	E	F	I
	Number of Baskets by Type				
	3	12	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 16 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	13	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

	2E + 17 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	14	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 18 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	14	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

	2E + 19 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	15	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

TABLE E-5 (cont'd) Double Story Basket Loads

	2E + 20 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	16	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

	2E + 21 Bay Double Story				
	Basket Type				
	A	D	E	F	I
	Number of Baskets by Type				
	3	16	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

TABLE E-5 (contd) Double Story Basket Loads

	2E + 22 Bay Double Story				
	Basket Type**				
	A	D	E	F	I
	Number of Baskets by Type				
	3	16	1	2	1
Anchorage Pin Assembly Mk 2*	-	-	-	5	-
Bag, Equipment	1	-	-	-	-
Carrying Bar	8	-	-	-	-
Carrying Handle	8	-	-	-	-
Clip, Retainer (in bag)	75	-	-	-	-
Handle, Jack	2	-	-	-	-
Jack Seating, Building Frame	-	-	-	-	4
Pin, Bracing	-	-	-	-	76
Pin, Launching Nose	6	-	-	-	-
Pin, Panel	-	7	3	-	-
Pin, Panel, Headless	-	-	5	-	-
*If required					

d. Link Reinforced

Table E-6 lists the additional baskets to those listed in Table E-5 that are required when building a link reinforced bridge.

TABLE E-6 Link Reinforced Basket Loads

	Basket Type			
	LRS A	LRS B	LRS C	LRS D
Anti-Flutter Cable Assembly	3	2	-	-
Bag, Equipment	-	-	1	1
Hammer, Plastic	2	2	-	-
Jack Seating Building Frame	-	-	1	1
Link, Launching, Two Tier	-	-	2	1
Pin, Bracing	11	11	-	-
Pin, Capsill	-	-	-	3
Pin, Launching Nose	20	20	-	-
Rope, Guard	2	2	-	-
Tackle, Light	5	5	5	5
Wrench, Ratchet Rev. 3/4 in	-	-	1	1

E-3 PALLET LOADS

a. Single Story

TABLE E-7 Single Story Pallet Loads

Components Required	4 Bay SS		5 Bay SS		6 Bay SS		
	Pallet No.1 SRDC 4	Pallet No.2 ES 4	Pallet No.3 SRDC 5	Pallet No.1 ES 5	Pallet No.2 SRDC 6	Pallet No.3 ES 6	Pallet No.4 SSE 6
Adapter Assembly, Push Bar	-	-	-	-	-	-	-
Baseplate SS	-	2	-	2	-	2	-
Beam, Bankseat	-	2	-	2	-	-	2
Bracket Assembly, Lifting	-	2	-	2	-	2	-
Cross Girder, Launching Nose	-	-	-	-	-	-	-
Cross Girder, Push Bar	-	-	-	-	-	-	-
Curb	8	-	10	-	12	-	-
Deck	16	-	20	-	20	-	4
Extractor, Cable Assembly	-	1	-	1	-	1	-
Launching Nose Unit Heavy	-	-	-	-	-	-	-
Launching Nose Unit, Light, Front	-	1	-	1	-	1	-
Launching Nose Unit, Light, Rear	-	1	-	1	-	1	-
Marker Guide Assembly	-	6	-	8	-	-	8
Panel, Top	-	8	-	10	-	4	8
Pedestal Landing Roller-	-	-	-	-	-	-	-
Pedestal, Building	-	2	-	2	-	2	-
Post Jacking	-	2	-	2	-	2	-
Post, Launching Nose	-	-	-	-	-	-	-
Push Bar, Short, Launching	-	-	-	-	-	-	-
Ramp Unit, Standard	14	-	-	14	-	14	-
Roller Beam, Assy	-	1	-	1	-	1	-
Roller Beam Support Assy. Fixed	-	2	-	2	-	2	-
Roller, Landing	-	1	-	1	-	1	-
Roller, Launching Nose Mk 2	-	-	-	-	-	-	-

TABLE E-7 (cont'd) Single Story Pallet Loads

Components Required	7 Bay SS			8 Bay SS			
	Pallet No.1 SRDC 6	Pallet No.2 ES 7/8	Pallet No.3 SSE	Pallet No.1 SRDC 6	Pallet No.2 ES 7/8	Pallet No.3 SSE	Pallet No.4 SSC 8
Adapter Assembly, Push Bar	-	-	-	-	-	-	-
Baseplate SS	-	2	-	-	2	-	-
Beam, Bankseat	-	-	2	-	-	2	-
Bracket Assembly, Lifting	-	2	-	2	-	2	-
Cross Girder, Launching Nose	-	-	-	-	-	-	-
Cross Girder, Push Bar	-	-	-	-	-	-	-
Curb	14	-	-	16	-	-	-
Deck	20	-	8	20	-	8	4
Extractor, Cable Assembly	-	1	-	-	1	-	-
Launching Nose Unit, Heavy	-	-	-	-	-	-	-
Launching Nose Unit, Light, Front	-	1	-	-	1	-	-
Launching Nose Unit, Light, Rear	-	1	-	-	1	-	-
Marker Guide Assembly	-	-	12	-	-	10	-
Panel, Top	-	8	8	-	8	8	4
Pedestal Landing Roller	-	-	-	-	-	-	-
Pedestal, Building	-	2	-	-	2	-	-
Post, Jacking	-	2	-	-	2	-	-
Post, Launching Nose	-	-	-	-	-	-	-
Push Bar, Short, Launching	-	-	-	-	-	-	-
Ramp Unit, Standard	14	-	-	-	14	-	-
Roller Beam, Assy	-	1	-	-	1	-	-
Roller Beam Support Assy Fixed	-	2	-	-	2	-	-
Roller, Landing	-	1	-	-	1	-	-
Roller, Launching Nose Mk 2	-	-	-	-	-	-	-

TABLE E-7 (cont'd) Single Story Pallet Loads

Components Req'd	9 Bay SS				10 Bay SS				
	Pallet No.1 SRDC 9	Pallet No.2 ES11/12	Pallet No.3 SSE	Pallet No.4 SSE 9	Pallet No.1 SRDC10	Pallet No.2 ES 11/12	Pallet No.3 SSE	Pallet No.4 SSC 10	Pallet No.5 SSC 8
Adapter Assembly, Push Bar	-	-	1	-	-	-	-	-	-
Baseplate SS	-	4	-	-	-	4	-	-	-
Beam, Bankseat	-	-	2	-	-	-	2	-	-
Bracket Assembly, Lifting	-	2	-	-	-	2	-	-	-
Cross Girder, Launching Nose	-	1	-	-	-	1	-	-	-
Cross Girder, Push Bar	-	1	-	-	-	1	-	-	-
Curb	18	-	-	-	20	-	-	-	-
Deck	20	-	8	8	20	-	8	8	4
Extractor, Cable Assembly	-	1	-	-	-	1	-	-	-
Launching Nose Unit Heavy	-	5	-	-	-	5	-	-	-
Launching Nose Unit, Light,	-	1	-	-	-	1	-	-	-
Front	-	-	-	-	-	-	-	-	-
Launching Nose Unit, Light	-	-	-	-	-	-	-	-	-
Rear	-	-	-	-	-	-	-	-	-
Marker Guide, Assembly	-	-	12	-	-	-	12	-	-
Panel, Top	-	-	8	10	-	-	8	8	4
Pedestal Landing Roller	-	1	-	-	-	1	-	-	-
Pedestal, Building	-	2	-	-	-	2	-	-	-
Post, Jacking	-	2	-	-	-	2	-	-	-
Post, Launching Nose	-	2	-	-	-	2	-	-	-
Push Bar Short Launching	-	1	-	-	-	1	-	-	-
Ramp Unit, Standard	14	-	-	-	14	-	-	-	-
Roller Beam, Assy	-	1	-	-	-	1	-	-	-
Roller Beam Support Fixed	-	2	-	-	-	2	-	-	-
Roller, Landing	-	1	-	-	-	1	-	-	-
Roller, Launching Nose Mk 2	-	1	-	-	-	1	-	-	-
Support, Jack	-	2	-	-	-	2	-	-	-

TABLE E-7 (cont'd) Single Story Pallet Loads

Components Req'd	11 Bay SS					12 Bay SS				
	Pallet No.1 SRDC 11	Pallet No.2 ES 11/12	Pallet No.3 SSE	Pallet No.4 SSC 10	Pallet No.5 SSC 11	Pallet No.1 SRD C 12	Pallet No.2 ES 11/12	Pallet No.3 SSE	Pallet No.4 SSC 12	Pallet No.5 SSC 10
Adapter Assembly, Push Bar	-	1	-	-	-	-	1	-	-	-
Baseplate SS	-	4	-	-	-	-	4	-	-	-
Beam, Bankseat	-	-	2	-	-	-	-	2	-	-
Bracket Assy, Lifting	-	2	-	-	-	-	2	-	-	-
Cross Girder, Launching Nose	-	1	-	-	-	-	1	-	-	-
Cross Girder, Push	-	-	-	-	-	-	-	-	-	-
Bar	-	-	-	-	-	-	-	-	-	-
Curb	22	-	-	-	-	24	-	-	-	-
Deck	20	-	8	8	8	20	-	8	12	8
Extractor Cable	-	1	-	-	-	-	1	-	-	-
Launching Nose Unit Heavy	-	6	-	-	-	-	6	-	-	-
Launching Nose Unit Light, Front	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit Light, Rear	-	-	-	-	-	-	-	-	-	-
Marker Guide, Assy	-	-	16	-	-	-	-	14	-	-
Panel, Top	-	-	8	6	-	-	8	8	-	8
Pedestal Landing Roller	-	1	-	-	-	1	-	-	-	-
Pedestal, Building	-	2	-	-	-	2	-	-	-	-
Post Jacking	-	2	-	-	-	-	2	-	-	-
Post, Launching Nose	-	2	-	-	-	2	-	-	-	-
Push Bar Short, Lau.	-	1	-	-	-	1	-	-	-	-
Ramp Unit, Std.	14	-	-	-	14	-	-	-	-	-
Roller Beam, Assy	-	1	-	-	-	-	1	-	-	-
Roller Beam Support Fixed	-	2	-	-	-	2	-	-	-	-
Roller, Landing	-	1	-	-	-	1	-	-	-	-
Roller, Launching Nose Mk 2	-	1	-	-	-	1	-	-	-	-
Support, Jack	-	-	-	-	-	-	-	-	-	-

b. Double Story

TABLE 8 Double Story Pallet Loads

Components Required	2E + 1 Bay DS				
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 1
Adapter Assy, Push Bar	1	-	-	-	-
Baseplate, DS	4	-	-	-	-
Beam, Bankseat	-	-	1	1	-
Brace, Sway	-	-	2	2	1
Bracket Assy, Lifting	2	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-
Curb	-	-	4	4	2
Deck	-	4	8	8	4
Extractor Cable, Assembly	1	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-
Longitudinal Girder	2	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4
Panel, Bottom	-	-	-	-	2
Panel, End Taper	-	-	2	2	-
Panel Erection Aid	2	-	-	-	-
Panel, Junction	-	-	2	2	-
Panel, Top	-	-	4	4	2
Pedestal, Landing Roller	1	-	-	-	-
Post, Jacking	2	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-
Ramp Unit, Long	-	12	-	2	-
Roller Beam, Assy	2	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-
Roller, Landing	1	-	-	-	-
Roller, Launching Nose	1	-	-	-	-
Support, Jack	2	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

	2E + 2 Bay DS				
Components Required	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 2
Adapter Assy, Push Bar	1	-	-	-	-
Baseplate, DS	4	-	-	-	-
Beam, Bankseat	-	-	1	1	-
Brace, Sway	-	-	2	2	2
Bracket Assy, Lifting	2	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-
Curb	-	4	4	-	4
Deck	-	4	8	8	8
Extractor Cable, Assembly	1-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-
Longitudinal Girder	2	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4
Panel, Bottom	-	-	-	-	4
Panel, End Taper	-	-	2	2	-
Panel Erection Aid	2	-	-	-	-
Panel, Junction	-	-	2	2	-
Panel, Top	-		4	4	4
Pedestal, Landing Roller	1	-	-	-	-
Post, Jacking	2		-	-	-
Post, Launching Nose Cr. Gdr.	2		-	-	-
Push Bar, Short, Launching	1	-	-	-	-
Ramp Unit, Long	-	12	-	2	-
Roller Beam	2	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-
Roller, Landing	1	-	-	-	-
Roller, Launching Nose	1	-	-	-	-
Support, Jack	2	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 3 Bay DS				
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC
Adapter Assy, Push Bar	1	-	-	-	-
Baseplate, DS	4	-	-		-
Beam, Bankseat	-	-	1	1	-
Brace, Sway	-	-	2	2	3
Bracket Assy, Lifting	2	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-
Cross Girder, Push Bar	1	-	-		-
Curb	-	-	4	4	6
Deck	-	4	8	8	12
Extractor Cable, Assembly	1	-	-		-
Jack Seat, Building Frame	4	-	-	-	-
Launching Nose Unit, Heavy	6		-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-
Longitudinal Girder	2	-	-	-	-
Marker, Guide Assembly	-	-	4	4	8
Panel, Bottom	-	-	-	-	6
Panel, End Taper	-	-	2	2	-
Panel Erection Aid	2	-	-	-	-
Panel, Junction	-	-	2	2	-
Panel, Top	-	-	4	4	6
Pedestal, Landing Roller	1	-	-	-	-
Post, Jacking	2	-	-	-	-
Post, Launching Nose Cr. Gdr.	2	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-
Ramp Unit, Long	-	12	-	2	-
Roller Beam	2	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-
Roller, Landing	1	-	-	-	-
Roller, Launching Nose	1	-	-	-	-
Support, Jack	2	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 4 Bay DS					
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 1	Pallet No.6 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-
Brace, Sway	-	-	2	2	1	3
Bracket Assy, Lifting	2	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-
Curb	-	-	4	4	2	6
Deck	-	4	8	8	4	12
Extractor Cable, Assembly	1	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	2	4
Panel, Bottom	-	-	-	-	2	6
Panel, End Taper	-	-	2	2	-	-
Panel Erection Aid	2	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-
Panel, Top	-	-	4	4	2	6
Pedestal, Landing Roller	1	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-
Roller Beam	2	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-
Support, Jack	2	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 5 Bay DS					
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 2	Pallet No.6 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-
Brace, Sway	-	-	2	2	2	3
Bracket Assy, Lifting	2	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-
Curb	-	-	4	4	4	6
Deck	-	4	8	8	8	12
Extractor Cable, Assembly	1	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4
Panel, Bottom	-	-	-	-	4	6
Panel, End Taper	-	-	2	2	-	-
Panel Erection Aid	2	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-
Panel, Top	-	-	4	4	4	6
Pedestal, Landing Roller	1	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-
Roller Beam	2	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-
Support, Jack	2	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 6 Bay DS					
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-
Brace, Sway	-	-	2	2	3	3
Bracket Assy, Lifting	2	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-
Curb	-	-	4	4	6	6
Deck	-	4	8	8	12	12
Extractor Cable, Assembly	1	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4
Panel, Bottom	-	-	-	-	6	6
Panel, End Taper	-	-	2	2	-	-
Panel Erection Aid	2	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-
Panel, Top	-	-	4	4	6	6
Pedestal, Landing Roller	1	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-
Roller Beam	2	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-
Support, Jack	2	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 7 Bay DS						
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 1	Pallet No.6 DSC	Pallet No.7 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-	-
Brace, Sway	-	-	2	2	1	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-
Curb	-	-	4	4	2	6	6
Deck	-	4	8	8	4	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4
Panel, Bottom	-	-	-	-	2	6	6
Panel, End Taper	-	-	2	2	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-
Panel, Top	-	-	4	4	2	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-
Roller Beam	2	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 8 Bay DS						
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 2	Pallet No.6 DSC	Pallet No.7 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-		-
Brace, Sway	-	-	2	2	2	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-
Curb	-	-	4	4	4	6	6
Deck	-	4	8	8	8	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	2	4	4
Panel, Bottom	-	-	-	-	4	6	6
Panel, End Taper	-	-	2	2	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-
Panel, Top	-	4	4	-	4	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-
Roller Beam	2	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 9 Bay DS						
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-	-
Brace, Sway	-	-	2	2	3	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6
Deck	-	4	8	8	12	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4
Panel, Bottom	-	-	-	-	6	6	6
Panel, End Taper	-	-	2	2	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-
Panel, Top	-	4	-	4	6	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-
Roller Beam	2	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 10 Bay DS							
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 1	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-	-	-
Brace, Sway	-	-	2	2	1	3	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-
Curb	-	-	4	4	2	6	6	6
Deck	-	4	8	8	4	12	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	-	4	4	4
Panel, Bottom	-	-	-	-	2	6	6	6
Panel, End Taper	-	-	2	2	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-
Panel, Top	-	-	4	4	2	6	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 11 Bay DS							
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC 2	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-	-	-
Brace, Sway	-	-	2	2	2	3	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-
Curb	-	-	4	4	4	6	6	6
Deck	-	4	8	8	8	12	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4
Panel, Bottom	-	-	-	-	4	6	6	6
Panel, End Taper	-	-	2	2	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-
Panel, Top	-	-	4	4	4	6	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 12 Bay DS							
	Pallet No.1 ED	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-
Beam, Bankseat	-	-	1	1	-	-	-	-
Brace, Sway	-	-	2	2	2	3	3	3
Bracket Assy, Lifting	2	-	-	-	-	-	-	-
Cross Girder, Building Frame	2	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-
Curb	-	-	4	4	4	6	6	6
Deck	-	4	8	8	8	12	12	12
Extractor Cable, Assembly	1	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-
Launching Nose Unit, Heavy	6	-	-	-	-	-	-	-
Launching Nose Unit, Light, Fr.	1	-	-	-	-	-	-	-
Launching Nose Unit, Light, Rr	1	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	2	4	4	4
Panel, Bottom	-	-	-	-	4	6	6	6
Panel, End Taper	-	-	2	2	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-
Panel, Top	-	-	4	4	4	6	6	6
Pedestal, Landing Roller	1	-	-	-	-	-	-	-
Post, Jacking	2	-	-	-	-	-	-	-
Post, Launching Nose Cr. Gdr	2	-	-	-	-	-	-	-
Push Bar, Short, Launching	1	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-
Roller Beam Support, Adjustable	4	-	-	-	-	-	-	-
Roller, Landing	1	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 13 Bay DS (w/o link reinforcement)									
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC1	Pallet No.10 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	1	-
Bracket, Assy Jacking (w/pullers)	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame-	3	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	2	-
Davit	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	4	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L. Fr	1	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	2	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-
Panel, Top	-	4	-	4	6	6	6	6	2	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 14 Bay DS (w/o link reinforcement)									
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC2	Pallet No.10 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	2	-
Bracket, Assy Jacking (w/pullers)	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame-	3	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	4	-
Davit	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	8	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L. Fr	1	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	4	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-
Panel, Top	-	4	-	4	6	6	6	6	4	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 15 Bay DS (w/o link reinforcement)									
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC	Pallet No.10 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	-
Bracket, Assy Jacking(w/pullers)	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame-	3	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	-
Davit	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-		-	-	-	-	-	-	6
Launching Nose Unit, L. Fr	1	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	4	-
Panel, Bottom	-	-	-	-	6	6	6	6	2	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 16 Bay DS (w/o link reinforcement)										
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC	Pallet No.10 DSC1	Pallet No.11 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	1	-
Bracket, Assy Jacking (w/pullers)	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame^	3	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	2	-
Davit	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	4	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Fr	1	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	2	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	2	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	2	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 17 Bay DS (w/o link reinforcement)										
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC	Pallet No.10 DSC2	Pallet No.11 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	-
Bracket, Assy Jacking(w/pullers)	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame^	3	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	4	-
Davit	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	8	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	2	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	4	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Fr	6	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	1	-	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	4	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	4	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-		-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2		-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-		-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose I	1	-	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 18 Bay DS (w/o link reinforcement)										
	Pallet No.1 ED^	Pallet No.2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No.5 DSC	Pallet No.6 DSC	Pallet No.7 DSC	Pallet No.8 DSC	Pallet No.9 DSC	Pallet No.10 DSC	Pallet No.11 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	-
Bracket, Assy Jacking(w/pullers)	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame^	3	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	6	-
Davit	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	12	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L. Fr	1	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L. Rr.	1	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-
Marker, Guide Assembly	-	-	4	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	6	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-		-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	6	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr. G	2	-	-	-	-	-		-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2		-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-		-	-	-	-
Roller Beam	2	-	-	-	-	-	-	-	-	-	-
Roller Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 19 Bay DS (w/o link reinforcement)											
	Pallet No 1 ED^	Pallet No 2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No 5 DSC	Pallet No 6 DSC	Pallet No 7 DSC	Pallet No8 DSC	Pallet No 9 DSC	Pallet No.10 DSC	Pallet No.11 DSC1	Pallet No.12 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	1	1	-	-	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	1	-
Bracket Assy Jacking(w/pullers)	-	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame	3	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	6	2	-
Davit	-	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	12	12	12	12	12	12	12	4	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L Fr	1	-	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L Rr.	1	-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-	-
Marker. Guide Assembly	-	-	4	4	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	6	2	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-	
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-	
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	6	2	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr G	2	-	-	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-	-	-
Raw Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Support Jack	2	-	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 20 Bay DS (w/o link reinforcement)											
	Pallet No 1 ED^	Pallet No 2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No 5 DSC	Pallet No 6 DSC	Pallet No 7 DSC	Pallet No8 DSC	Pallet No 9 DSC	Pallet No.10 DSC	Pallet No.11 DSC2	Pallet No.12 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	1	1	-	-	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	2	-
Bracket Assy Jacking (w/pullers)	-	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame	3	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	6	4	-
Davit	-	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	12	8	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L Fr	1	-	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L Rr.	1	-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-	-
Marker. Guide Assembly	-	-	4	4	4	4	4	4	4	2	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	6	4	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	6	4	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr G	2	-	-	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-	-	-
Raw Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Support Jack	2	-	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE 8- (cont'd) Double Story Pallet Loads

Components Required	2E + 21 Bay DS (w/o link reinforcement)											
	Pallet No 1 ED^	Pallet No 2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No 5 DSC	Pallet No 6 DSC	Pallet No 7 DSC	Pallet No 8 DSC	Pallet No 9 DSC	Pallet No.10 DSC	Pallet No.11 DSC	Pallet No.12 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	3	-
Bracket Assy Jacking (w/pullers)	-	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame	3	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	6	6	-
Davit	-	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	12	12	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L Fr	1	-	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L Rr.	1	-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-	-
Marker. Guide Assembly	-	-	4	4	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	6	6	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	6	6	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr G	2	-	-	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-	-	-
Raw Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	-	2
Roller', Landing^	2	-	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Support, Jack	2	-	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

TABLE E-8 (cont'd) Double Story Pallet Loads

Components Required	2E + 22 Bay DS (w/o link reinforcement)											
	Pallet No 1 ED^	Pallet No 2 LR/D	Pallet No.3 EOB 1	Pallet No.4 EOB 2	Pallet No 5 DSC	Pallet No 6 DSC	Pallet No 7 DSC	Pallet No8 DSC	Pallet No 9 DSC	Pallet No.10 DSC	Pallet No.11 DSC1	Pallet No.12 LRS2
Adapter Assy, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Baseplate, DS	4	-	-	-	-	-	-	-	-	-	-	2
Beam, Bankseat	-	-	1	1	-	-	-	-	-	-	-	-
Brace, Sway	-	-	2	2	3	3	3	3	3	3	1	-
Bracket Assy Jacking(w/pullers)	-	-	-	-	-	-	-	-	-	-	-	2
Capsill	-	-	-	-	-	-	-	-	-	-	-	1
Cross Girder Building Frame	3	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Cross Girder, Push Bar	1	-	-	-	-	-	-	-	-	-	-	-
Curb	-	-	4	4	6	6	6	6	6	6	2	-
Davit	-	-	-	-	-	-	-	-	-	-	-	2
Deck	-	4	8	8	12	12	12	12	12	12	4	-
Extractor Cable Assembly	1	-	-	-	-	-	-	-	-	-	-	-
Jack Seat, Building Frame	4	-	-	-	-	-	-	-	-	-	-	2
Launching Nose Unit Heavy	6	-	-	-	-	-	-	-	-	-	-	6
Launching Nose Unit, L Fr	1	-	-	-	-	-	-	-	-	-	-	-
Launching Nose Unit, L Rr.	1	-	-	-	-	-	-	-	-	-	-	-
Longitudinal Girder	2	-	-	-	-	-	-	-	-	-	-	-
Marker. Guide Assembly	-	-	4	4	4	4	4	4	4	4	-	-
Panel, Bottom	-	-	-	-	6	6	6	6	6	6	2	-
Panel, End Taper	-	-	2	2	-	-	-	-	-	-	-	-
Panel Erection Aid	2	-	-	-	-	-	-	-	-	-	-	-
Panel, Junction	-	-	2	2	-	-	-	-	-	-	-	-
Panel, Top	-	-	4	4	6	6	6	6	6	6	2	-
Pedestal, Landing Roller	1	-	-	-	-	-	-	-	-	-	-	2(Mk2)
Post Jacking	2	-	-	-	-	-	-	-	-	-	-	2
Post, Launching Nose Cr G	2	-	-	-	-	-	-	-	-	-	-	-
Push Bar, Long, Launching	-	-	-	-	-	-	-	-	-	-	-	2
Push Bar, Short, Launching	2	-	-	-	-	-	-	-	-	-	-	-
Ramp Unit, Long	-	12	-	2	-	-	-	-	-	-	-	-
Roller Assembly, Rocking	-	-	-	-	-	-	-	-	-	-	-	2
Roller Beam	2	-	-	-	-	-	-	-	-	-	-	-
Raw Beam Support Adjustable	4	-	-	-	-	-	-	-	-	-	-	2
Roller, Landing^	2	-	-	-	-	-	-	-	-	-	-	-
Roller, Launching Nose	1	-	-	-	-	-	-	-	-	-	-	-
Support Jack	2	-	-	-	-	-	-	-	-	-	-	-

^ Qty increased for 13 thru 22 bay DS

c. Link Reinforced

For 2E + 13 thru 2E + 22 bay link reinforced bridges the pallet loads are the same as non reinforced bridges with the addition of LRS1. The following table lists the components in LRS1 and LRS2.

TABLE E-9 Link Reinforced Pallet Loads

Components Required	Pallet Load	
	LRS1	LRS2
Anchor Piece, Assembly	4	-
Basket, Equipment	2 (A&B)	2 (C&D)
Bearer, Footwalk	4	-
Bracket Assembly, Jacking	-	2
Capsill	-	1
Davit Post Assembly	-	2
Footwalk	4	-
Launching Nose Heavy	-	6
Link, Reinforcing, Long	20	-
Link, Reinforcing, Short	4	-
Pedestal, Landing Roller	-	2
Post Tensioning Assembly (Short Post)	4	-
Push Bar long Launching	-	2
Post, Footwalk	10	-
Roller Assembly, Rocking	-	2

A

Abbreviations
glossary: *10-1* 1-6
list: *10-1* 1-4

Add. Auth. List: *10-1* C-1

Adjustable Support
description: *10-1* 1-29
maint.: *10-1* 8-28, 8-30, 8-32

Anchor Assembly
description: *10-1* 1-47
general drills: *10-1* 4-53
Anchorage
Double Story: *10-1* 6-72
Link Reinforced Bridges: *10-1* 7-40
Single Story: *10-1* 5-46
Anchorage Pin, description: *10-1* 1-45
Anti Flutter Tackle, general drills: *10-1* 4-62
Anti-flutter Tackle, description: *10-1* 1-49
Anti-Skid, maint.: *10-1* 8-40

B

Bankseat Beam
description: 10-*1* 1-16
resilient mount, maint.: *10-1* 8-10
shoot boll, maint.: *10-1 8*-12
Baseplate Double Story, description: *10-1* 1-28
Baseplate Single Story, description: *10-1* 1-27
Basket Loads: *10-1* E-12
Bottom Panel
description: 10-*1* 1-22
general drills: *10-1* 4-18
resilient mount, maint.: *10-1* 8-10
shoot bolt, maint.: *10-1* 8-14
Bracing Pin, description: 10-*1* 1-27

Bridge Length, description: *10-1* 1-10
Bridge Marker Guide, description: *10-1* 1-20

Build and Boom Table
Double Story
1 thru 3 bay (res.): *10-22-22*
1 thru 6bay: *10-1* 6-3; *10-2* 2-14
1 thru 6 bay (res.): *10-1* 6-7
10 thru 12 bay (res.): *10-1* 6-9; *10-2* 2-28
13 thru 17 bay w/LRS: *10-1* 7-2; *10-2* 2-62
13 thru 17 bay w/o LRS: 1*0-1* 6-5; *10-2* 2-18
18 thru 22 bay w/LRS: *10-1* 7-4; *10-2* 2-64
18 thru 22 bay w/o LRS: *10-1* 6-6*; 10-2* 2-20
4 thru 6 bay (res.): *10-2* 2-24
7 thru 12 bay: *10-16-; 10-22-16*
7 thru 9 bay (re.): *10-1* 5-5; *10-2* 2-6

Single Story
4 thru 8 bay: *10-1* 5-3*; 10-2* 2-2
9 thru 12 bay: *10-1* 5-4*; 10-2* 2-4
9thru 12 bay (res.): *10-1* 5-5 *10-2* 2-6
Building Pedestal, description: *10-1* 1-43

C

Cof G: *10*-1 4-2
C.O.l.E. & Basic Issue: *10-1* B-1
Capsill, description: *10-1* 1-52
Capsill Pin, description: *10-1* 1-55
Carrying Bar, description: *10-1* 1-46
Carrying Handle, description: *10-1* 1-47
Components/Bridge Length: *10-1* E-1
Counterweights
Double Story: *10-1 6-64*
Link Reinforced Bridges: *10-1* 7-38
Single Story: *10-1* 5-39
Curb, description: *10-1* 1-19

D

Davit Post Assembly, description: *10-1* 1-53
De-Launch Table
Double Story
1 thru 4 bay (res.): *10-1* 6-19*; 10-2* 2-46
1 thru 5 bay (res. far bank): *10-1* 6-24; *10-2* 2-54
1 thru6bay: *10-1* 6-11; *10-2* 2-30
1 thru6bay(farbank): *10-1* 6-15; *10-2* 2-38
10 thru 12 bay (res. far bank): *10-1* 6-27; *10-2* 2-59
10 thru 12 bay (res.): *10-1* 6-22; *10-2* 2-52
13 thru 17 bay w/LRS: *10-1* 7-6, 7-7, 7-10, 7-11; *10-2* 2-67, 2-72
13 thru 17 bay w/o LRS: *10-1* 6-13; *10-2* 2-34
13 thru 17 bay w/o LRS (far bank): *10-1* 6-17; *10-2* 2-42

18 thru 22 bay w/LRS: *10-1* 7-8, 7-9, 7-12, 7-13; *10-2* 2-69, 2-75
18 thru 22 bay w/o LRS: *10-1* 6-14; *10-2* 2-36
18 thru 22 bay w/o LRS(far bank):*10-1*
18 thru 22 bay w/o LRS (far bank): *10-1* 6-18; *10-2* 2-44
5 thru 6 bay (res.): *10- 1* 6-20; *10-2* 2-48
6 thru 9 bay (res.far bank): *10-1* 6-25; *10-2* 2-56
7thru 12 bay: *10-1* 6-12*; 10-2* 2*-32*
7 thru 12 bay (far bank): *10-1* 6-16; *10-2* 2-40
7 thru 9 bay(res.): *10-1* 6-21; *10-2* 2-50
Single Story
4 thru 8 bay: *10-1* 5-6; *10-2* 2-8
9 thru 2 bay: *10-1* 5-7; *10-2* 2-10
9 thru 12 bay (res.): *10-1* 5-8; *10-2* 2-12
Deck Unit, description: *10-1* 1-19
Double Story
12 bay assembly: *10-1* 6-29
12 bay assembly (res.): *10-1* 6-6
12 bay disassembly: *10-1* 6-34
12 bay disassembly (far bank): *10-1* 6-40
12 bay disassembly (res. far bank): *10-1* 6-60
12 bay disassembly (res.): *10-1* 6-58
22 bay assembly (w/o LRS): *10-1* 6-45
22 bay disassembly (w/o LRS): *10-1* 6-50

E

End Taper Pane
description: *10-1* 1-24
resilient mount, maint.: *10-1* 8-10
Equip. Data: *10-2* 1-2
Equipment Bag, description: *10-1* 1-69

Equipment Basket, description: *10-1* 1-70

Erection and Launching Components, description: *10-1* 1-27
Expend./Durable: *10-1* D-1

Extractor Cable, description: *10-1* 1-66

F

First Link, general drills: *10-1* 4-53
Fixed Support
description: *10-1* 1-28
maint.: *10-1* 8-34
Footwalk
description: *10-1* 1-53
general drills: *10-1* 4-56

Footwalk Bearer, description: *10-1* 1-51

Footwalk Post, description: *10-1* 1-58
Frame Cross Girder, description: *10-1* 1-30

Front End of Bridge, general drills: *10-1* 4-20

G

Guard Rope, description: *10-1* 1-62

H

Headless Panel Pin: *10-1* 1-26
Hydraulic Jack 15 Ton, description: *10-1* 1-32
Hydraulic Jack 15T, maint.: *10-1* 8-22

Hydraulic Jack 20 Ton, description: *10-1* 1-32
Hydraulic Jack 20T, maint.: *10-1* 8-24

I

Introduction: *10-2* 1-1

J

Jack Post
description: *10-1* 1-34
maint.: *10-1* 8-26

Jack Seat, description: *10-1* 1-33
Jack Support, description: *10-1* 1-35
Jacking Bracket
description: *10-1* 1-51
maint.: *10-1* 8-36
Junction Panel
description: *10-1* 1-23
resilient mount, maint.: *10-1* 6-10
shoot bolt, maint.: *10-1* 6-12

L

L Z No.: *10-1* 4-4
Landing Roller, description: *10-1* 1-41
Landing Roller Pedestal
general drills: *10-1* 4-49

MK.I., description: *10-1* 1-42
MK.II., description: *10-1* 1-57
Launching Nose, general drills
assemble for launch: *10-1* 4-36
assembling for delaunch: *10-1* 4-47
astripping for delaunch: *10-1* 4-47
stripping for delaunch: *10-1* 4-45
Launching Nose Code: *10-1* 4-3
Launching Nose Cross Girder, description: *10-1* 1-40

Launching Nose Cross Girder Post, description: *10-1* 1-9
Launching Nose Heavy
description: *10-1* 1-37
resilient mount, maint.: *10-1* 8-10
shoot bolt, maint.: *10-1* 8-12
Launching Nose Link, description: 10-*1* 1-55
Launching Nose Pin, description: *10-1* 1-45
Launching Nose Roller
description: 10-*1* 1-38
general drills: *10-1* 4-33
Lifting Sling, description: *10-1* 1-67
Light Launching Nose
Front Section, description: 10-*1* 1-35
Rear Section, description: *10-1* 1-36
Light Tackle
description: *10-1* 183
general drills: *10-1* 4-61
Link Components, general drills: *10-1* 442

Link Reinforced
22 bay assembly: *10-1* 7-14
22 bay disassembly: *10-1* 7-25
22 bay disassembly (far bank): *10-1* 7-34
Link Reinforcement Components, descriptions: *10-1* 1-47
LNCG
general drills: *10-1* 4-33
maint.: *10-1* 8-18, 8-20
LNCG Post, general drills: *10-1* 4-33
Long Reinforcing Link, description: *10-1* 1-56
Longitudinal Girder, description: *10-1* 1-32

M

Medium Girder Bridge
data: *10-1* 1-72
principles of operation: *10-1* 1-85
MGB, description: *10-1* 1-8

N

Nylon Faced Hammer, description: *10-1* 1-5

O

Operator
lubrication: *10-1* 8-2
maint.: *10-1* 8-1
troubleshooting: *10-1* 8-2
Overbridges
Double Story: *10-1* 6-67
Single Story: *10-1* 5-41

P

Packing, description: *10-1* 1-71
Pallet, description: *10-1* 1-84
Pallet Adapter, description: *10-1* 1-66
Pallet Loads: *10-1* 30
Palletization
double story: *10-1* 3-85
link reinf.: *10-1* 3-109
loading on vehicles: *10-1* 3-132
off loading from vehicles: *10-1* 3-132
single story: *10-1* 3-57
spares: *10-1* 3-122

Panel Erection Aid, description: *10-1* 1-46
Panel Pin, description: *10-1* 1-26
Panel Point Code: *10-1* 42
PMCS: *10-1* 2-1
daily: *10-1* 2-2
monthly: *10-1 2-3*
Post Tensioning Assembly, description: *10-1* 1-59
Post Tensioning Assy, general drills: *10-1* 4-56
Preparation for Use
prelim. planning: *10-1* 3-2
prelim. studies: *10-1* 3-8
reccon. report: *10-1* 3-14
site selection: *10-1* 3-8
Puller
description: *10-1* 1-60
general drills: *10-1* 4-63
maint.: *10-1* 6-38

Push Bar Adapter, description: *10-1* 1-44
Push Bar Cross Girder, description: *10-1* 1-43
Push Bar Long, description: *10-1* 1-50
Push Bar Short, description: *10-1* 1-43

R

Ramp Unit Short and Long, Description: *10-1* 1-17
Ratchet Wrench 3/4 in, description: *10-1* 1-62
Rear End of Bridge, general drills: *10-1* 4-25
References: *10-1* A-1
Retainer Clip, description: *10-1* 1-27

Rocking Roller, description: *10-1* 1-61
Roller Beam
description: *10-1* 1-31
maint.: *10-1* 8-16
Roller Beams, general drills: *10-1* 4-4
Rubber Bumper, description: *10-1* 1-67

S

Second Link, general drills: *10-1* 4-56
Short Reinforcing Link, description: *10-1* 1-56
Single Story
12 bay assembly: *10-1* 5-20
12 bay assembly (res.): *10-1* 5-32
12 bay disassembly: *10-1* 5-27
12 bay disassembly (res.): *10-1* 5-36
5 bay assembly: *10-1* 5-9
5 bay disassembly: *10-1* 5-14
Strap
10,000lb, description: *10-1* 1-69
5,000lb, description: *10-1* 1-68
Support Equipment, descriptions: *10-1* 1-64
Sway Brace, description: 10-*1* 1-25

T

Tensioning, general drills: *10-1* 4-63
Tie Down Lug, description: *10-1* 1-70
Tie Down, Cargo, Aircraft, MB-1, description: *10-1* 1-70
Top Panel
description: *10-1* 1-15
general drills: *10-1* 4-16
resilient mount, maint.: *10-1* 8-10
shoot bolt, maint.: *10-1* 8-12
Trailer, 4 Ton, description: *10-1* 1-65
Truck, 5 Ton Dump, description: *10-1* 1-65

U

Unusual Conditions
high winds: *10-1 2-4*
operation: 10-*1 2-4*
steep slopes: *10-1 2-6*

V

V Distance Table, Double Story

1 thru 6 bay: *10-2* 2-78
13 thru 17bayw/LRS: *10-2* 2-80
13 thru 17 bay w/o LRS: *10-2* 2-79
18 thru 22 bay w/LRS: *10-2* 2-80
18 thru 22 bay w/o LRS: *10-2* 2-79
7 thru 12 bay: *10-2* 2-78

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7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. Publication Date: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. Submitter Phone: 123-123-1234
17. **Problem: 1**
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
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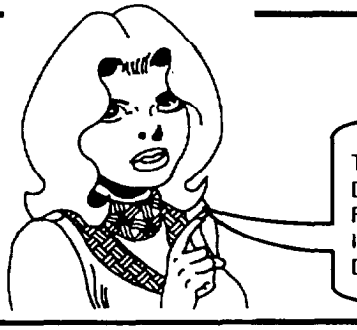

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22 August 1992

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TM 1-1520-250-10	15 June 1992	Operator's manual MH60K Helicopter

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PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	

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In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

Callout 16 on figure 4-3 is pointed at a bolt. In key to figure 4-3, item 16 is calle a shim. Please correct one or the other

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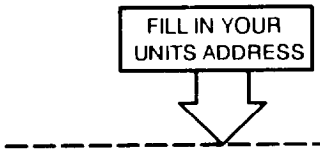

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

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°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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